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A. PRESCOTT FOLWELL, Editor · · W. A. HARDENBERGH, Asso. Editor

Timewasters

This column, in the absence of WAH, who has been called to active duty with the army, is conducted this month by W. M. Lee of The Gorman-Rupp Co.

Celebrating At The World's Fair:

A gent from one of our Ohio towns went to New York to the World's Fair. It cost him $1 to get into the first exhibit; while in there he spent half of what money he had, and he tipped the pretty girl attendant at the exit $1. It cost him $1 to enter the aquacade, he spent half of what he had left, and spent a dollar for a parcel of eats as he left. It cost him a dollar to enter Gypsy Rose Lee's (no relation) place, and there he spent half of what he had with him. It cost a dollar to get out. Still full of pep he paid another dollar to get into "Believe It or Not," spent half of what he had left there, and going out, gave his last dollar to the first man he met. How much good Ohio dough did he have when he started?

Solutions Of September Timewasters

John Bevan, at the request of some of our readers, furnishes detailed solutions of his September problems as follows:

The chance that Jones and Smith made the 2 hits while Brown missed is 4/5 x 3/4 x 1/3 or 12/60. The chance that Jones and Brown hit while Smith missed is 4/5 x 2/3 x 1/4 or 8/60. The chance that Jones is the one that missed is 1/5 x 2/3 x 3/4 or 6/60. Therefore the chance that one of the hits was made by Jones is $\frac{12/60 \text{ \& } 8/60}{12/60 \text{ \& } 8/60 \text{ \& } 6/60}$ or 10/13.

Princeton won the game if both Burroughs and Anderson tell the truth or if neither of them tell the truth. The chance that they both tell the truth is 10/11 x 3/4 or 30/44. The chance that both told a lie is 1/11 x 1/4 or 1/44. The total chance that Princeton won is the sum of these probabilities or 31/44.

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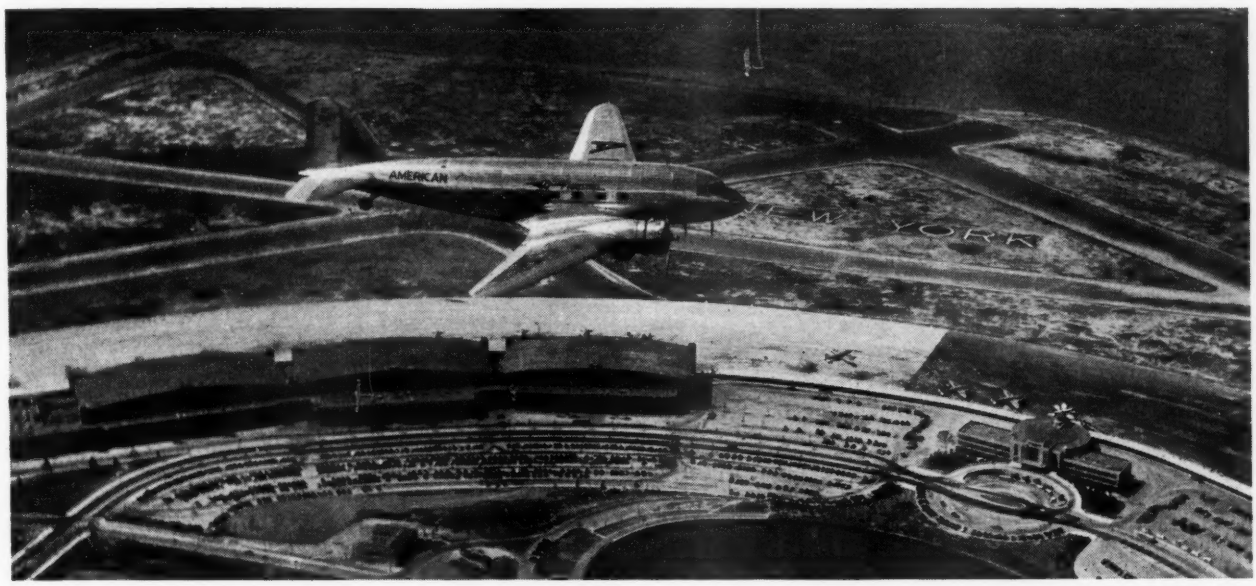


Courtesy American Airlines

Part of New York City's Airport
Administration building at the right; terminal buildings at the left; parking spaces in foreground.

Requirements for Airports, Scheduled and Unscheduled

By J. B. HARTRANFT, JR., EXEC. SECT'Y.
Aircraft Owners and Pilots Association

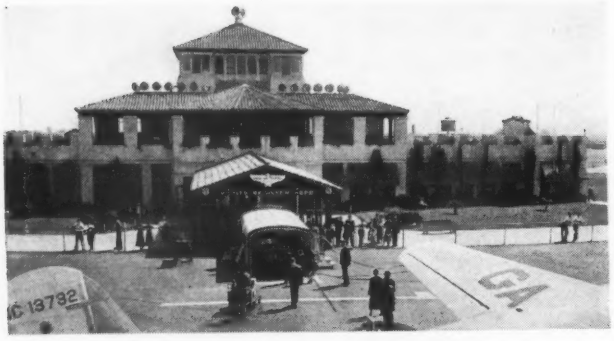
Considerations in the selection of a site, and conditions required and desirable to be provided by the designer and engineer—drainage, sanitation and administration and terminal buildings.

MOST aviation leaders agree that future airport development will be along two rather distinct lines: 1. Airline terminals providing scheduled service for air travelers, express and air freight, and 2. Non-scheduled airports serving miscellaneous commercial operations and accommodating itinerant private aircraft.

The latter class are greater in number than the former but less exacting in their requirements. Speaking broadly, we may say that it is not entirely necessary to prepare an airport for non-scheduled flying with hard-surfaced runways such as must be furnished for terminal airports. Nor is it necessary to have elaborate administration buildings or other facilities for public convenience, but only suitable hangaring space, shops, and a small office or reception quarters for itinerant pilots and local aircraft owners.

The site selected should have sufficient slope to provide adequate natural drainage, and should, if possible, not require heavy grading nor contain slopes so steep that serious erosion might result. A preferable airport is one where all the area within the boundaries is safe and usuable for aircraft, but in some sections the topography is so uneven that grading the entire area to this condition would be economically unsound, and here the landing strip type of field is generally more feasible.

Among other considerations in the selection of a site are a firm surface well drained at all times, feasible meteorological conditions, freedom from surround-



Union terminal at Los Angeles, Calif.

ing obstructions, maintenance of sufficient distance from other airports, accessibility, topographical conditions, soil characteristics, location with respect to utility services and to lines of air traffic or existing airways, and availability of construction materials. Also consideration should be given to the distance which electric power, telephone, gas, water and sewer lines must be extended to serve the proposed site.

Proper drainage of the land area is always essential, whether we are considering paved runways or sodded grass strips. The drainage must be adequate to carry off excess rain water from all the areas actually used in take-off and landing operations of the aircraft. That portion of the precipitation which percolates into the ground is of primary importance. In planning for the removal of this, it is necessary to consider the character and arrangement of the soil layers in the field, the amount, frequency, intensity, duration and season of occurrence of the heaviest rainfalls, the slope of the surface, soil mixture and temperature.

Careful consideration should be given to the various problems involved in the design and construction of administration and terminal buildings, hangars and other types of buildings; also to the provision of adequate areas for parking of automobiles, not only for the public who will visit the airport as spectators, but also for the air-carrier passengers.

The size of the administration building and its facilities will depend on the air traffic to be accommodated, varying from small buildings at airports used by a feeder line having one or two schedules a day, to the enormous terminal buildings found at the Chicago and New York airports. Terminal buildings should provide the same facilities for serving passengers and the general public as are found in other transportation terminals. The administration building may well include the office of the airport manager, U. S. Weather Bureau and Communications offices; ticket, telegraph and information offices; comfortable waiting and rest rooms; restaurant; roof garden; mail, express and check rooms; public telephone booths, and concession stands. Many airports have found it profitable to arrange for non-aviation income business and concessions. There should also be an airport traffic control tower if required by the traffic handled at the airport. Whether the airport is an itinerant or a scheduled field, there should be suitable plumbing for lavatory facilities, shop maintenance and washing down of airplanes, as well as recreational facilities. It is likewise necessary to provide adequate facilities for waste disposal, including oil drainage.

The Secretary of the Air Transport Association of America, Fowler Barker, has outlined what the airlines would like to have, although they may not expect to get it all. As an ideal, he suggests that the airport should be at least a mile square, though 4200 feet square might do in a pinch; feeder airports would require less and non-scheduled and itinerant fields considerably less. Airports entirely paved or with two parallel runways in all necessary directions. The terminal building should combine the best features of North Beach, the proposed Gravelly Point airport and the modernized terminal building at Kansas City. There should be large signs over sand-filled receptacles telling the passengers to drop their cigarettes into the receptacles before entering the airplane area. There should be complete lighting equipment, including lead-in and runway lines for instrument approaches and zero zero visibility and ceiling landings. There should be absolutely clear approaches in all directions—at least a 50 to 1 ratio. There should be a restaurant and lounge comparing with Fred Harvey's at the Union Station in Kansas City. There should be fences around the entire airport; ample parking areas, and personnel immaculately uniformed who are hard-boiled but diplomatic. The premises should be well-kept; fences painted; waiting and rest rooms cheerful and clean; and there should be a hotel on or adjacent to the airport for the use of pilots, stewardesses and passengers at reasonable rates.

The volume of traffic at Chicago Municipal Airport is reported at present to be about 200 transport schedules and about four times that many non-scheduled landings. St. Louis Municipal Airport is reported as having 46 schedules per day and a total average of 500 per day. On busy days in the summer, private planes are restricted to a certain portion of the field so that they will not get in the way of transports. The Aircraft Owners & Pilots Association, representing thousands of non-scheduled pilots, and the Air Transport Association, representing the airline companies, are at present working out a scientific formula to determine the traffic saturation point of airports.

Scheduled air traffic is naturally much more uniform throughout the year than the non-scheduled. At the Chicago Municipal Airport during the 12 months of 1939, the scheduled traffic varied from an average monthly total of 3612 in summer to 2808 in winter; the non-scheduled from 4389 to 1755. There is a constant increase in traffic from year to year; records at the Lambert-St. Louis Municipal Airport show an increase in take-offs and landings of 18% between 1936 and 1937, 24% 1937 and 1938 and 16% between 1938 and 1939.

Cost of Cleaning Sewers Reduced by Better Equipment

About 20 miles of 6 and 8-inch sewer laterals are rodded and cleaned each year in Lewiston, Idaho, work starting in the late fall, after the growing season is over, and continuing into early winter. It has been found that by cleaning the smaller laterals each year, most of the root trouble is avoided, and very few sewers become plugged. New equipment, purchased two years ago, consisting of ⅝-inch jointed flexible steel rods, has speeded up the rodding a great deal and has reduced the cost about 35 per cent. The rods are connected and unrolled from a reel from the street, inserted into the sewer through a curved pipe through the manhole. Working from the street is not only faster, but more healthful for the men than the old method of using jointed wooden rods, connecting them and rodding from the bottom of the manhole. Much less trouble is experienced from rods sticking in the pipe on account of bad pipe joints or root clumps. A total of 20.52 miles of sewer were rodded during the year. W. P. Hughes is City Engineer.

Airport Drainage and Subdrainage

This is probably the most important feature of airport construction. This article discusses the requirements wherein it differs from highway drainage and how to meet them.

MODERN airplanes impose heavy wheel loads on runways. No surfacing can support these loads unless there is a firm and stable subbase beneath. This requires subdrainage to remove sursurface water. Surface water on runways should also be removed promptly to prevent interference with operations, erosion or percolation into the subgrade.

While airport drainage, both surface and subsurface, is based on the general principles of street and highway drainage, there are various differences in the application of these principles. Ditches and gutters are objectionable at airports from a safety angle and storm water must be intercepted and removed by other methods. Subsurface water must be removed promptly to prevent softening the surface of the field or of the subbase of the runways. In some cases, the same drains can carry both surface and subsurface water. Finally, the drains need to be able to withstand impact and heavy loads.

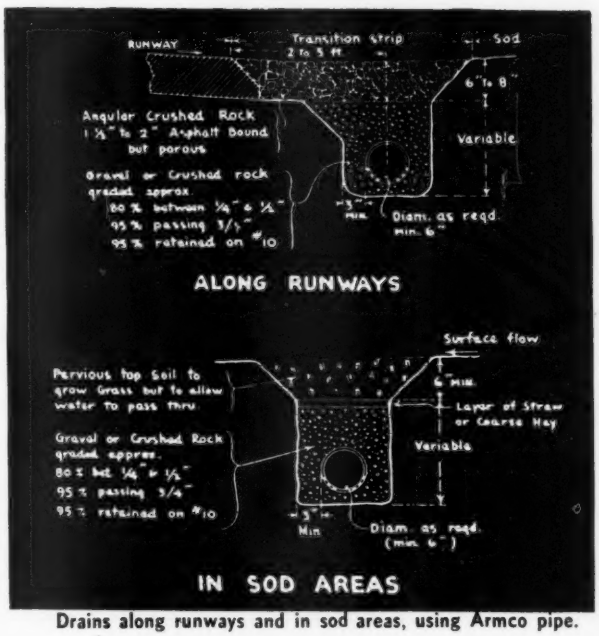
The type of field influences design. The fields at non-scheduled airports serving communities of 5,000 population or less, may not have surfaced runways. In such cases there will be a smaller surface runoff to be cared for; and in an "all-over-sod" field, topography governs the layout. When there are paved runways or these are contemplated, all drainage is primarily designed with respect to them.

Drainage cannot readily be installed or augmented after the runways have been built. Therefore, careful consideration of future needs will greatly reduce the possibility of heavy costs at a later date.

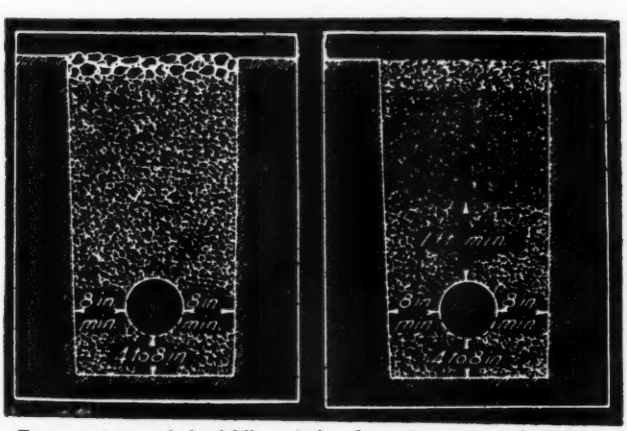
Subsurface Drainage

The principal function of subsurface drains is to lower the water table and to keep it low, even during periods of continued rainfall. In some cases, seepage zones must be intercepted, as in highway drainage.

A study of the soil at the airport site is therefore a first necessity. According to Armco's Manual of Airport Drainage, these studies should determine: (1) The drainability of the soil; (2) the stability of the subgrade under the runways and the grassed area; and (3) the location of the water table and of any seepage areas. Soil studies can be made very well with a soil auger or post-hole digger. Such tools will permit quite easy determination of the depth of the water table; visually and with a soil auger a great deal of information can be obtained in regard to seepage, springs, capillarity, water bearing strata and underlying impervious strata. It is recommended that, where engineers are not familiar with soil analysis procedures, soil samples be submitted to laboratories for study and report. Such facilities are possessed by some county highway departments, practically all of the state highway departments, and many colleges and universities. A number of commercial laboratories are equipped for this work.



Drains along runways and in sod areas, using Armco pipe.



Toncan pipe with backfill entirely of pervious material (left), and with upper portion consisting of impervious soil.

For airport subdrainage, subsurface runoff factors have been determined by experiment as equivalent to a certain depth of water to be drained away during a period of 24 hours. Normally, this will be about 5/16 to ⅜ inch of water (Engineering Experiment Stations, Universities of Iowa and Minnesota). A drainage of 5/16 inch per 24 hours, as shown in the accompanying table, amounts to a flow of .0131 cu. ft. per second per acre. Other data are shown in the table.

Depth and spacing of subdrains depend upon soil characteristics. These drains will normally be 2 to 4 feet deep to the bottom of the drain; the spacing will vary from 25 or 30 feet in clay soils to 100 feet or more in open, sandy, porous soils. A table of depths and spacing of subdrains, as recommended by Armco is shown herewith.

For wide runways, parallel lines along the edges

(Continued on page 44)

Six-inch flat top drain pipe installed at the runways.

Building Youngstown's

By JAMES R. SHUTTS

THIS fall Youngstown, Ohio, will dedicate its new airport, which will be one of the most modern yet constructed. Located ten miles north of Youngstown, near the hamlet of Vienna, the new airport contains 604 acres, forming almost a perfect square at an elevation approximately 1150 feet above sea level. The cost will be about $2,500,000, primarily because the job is being done on such a long-range basis that it is expected to accommodate anything that airplane engineers will produce within the next 50 years, but also because of its size.

Despite the fact that the site was considered as an ideal one before the work started, the project entails moving about 1,000,000 cubic yards of earth. The general contour of the airport area was excellent for drainage, with a high line running east and west through the center; however, the area was marred by gullies, ravines and sink holes, and it was not good farming land. It was necessary to remove 5,000 trees and stumps before grading could be started. Tractors were used for taking out the stumps and handling the trees.

Work began in July, 1939, and about half of the earth was moved by May, 1940. In considering the rate at which work was carried on, it must be borne in mind that efficiency of machine operation on the WPA project was hindered because (1) the equipment was rented, and (2) when work began in July, 1939, the Youngstown district was feeling the first flush of an industrial boom. This meant that many of the machines employed on the project were operated by novices. Shovel operators, in particular, were hard to get, because the experienced men went to work in the strip coal mines south of the city.

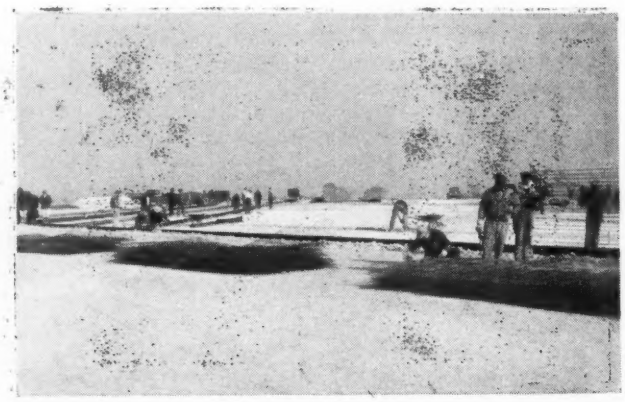
From the beginning of work until late in the fall of last year, earth-moving equipment averaged about 3,000 cubic yards a day. At first two gasoline shovels —one P & H and one Byers—of ¾ yard capacity each, were used. Later on, a Lorain "75" with a 1½-yd. bucket was added, and also two LeTourneau 12-yard power scrapers. Edward H. Turner, assistant city engineer in charge of WPA projects, said that the scraper operations were found to be economical in moving short haul dirt—up to about 1500 feet. The airport soil texture is a gummy clay.

An extraordinary rainy period in May and June threw the work far behind schedule, but by July 1, 1940, about half of the dirt had been moved. The M. DeBartola Construction Co. then placed an order for three 15-yd. Galion Cyclone graders and these have been performing very satisfactorily. Ralph O'Neill, city engineer, states that each of these units is moving between 700 and 900 cubic yards per day—a total of 2,100 to 2,700 cubic yards—depending on the length of haul, and that their use will cut several weeks off the required construction time.

(Editor's note: Mr. Edward H. Turner died during the preparation of this article. His position in Youngshas been filled by J. Joseph Smith. Edwin S. Turner, son of the late engineer, is continuing as project supervisor at the airport).

For a period before wet weather interfered with the operations late last fall, work was carried on by three shifts, using floodlights. Some of the equipment, no-

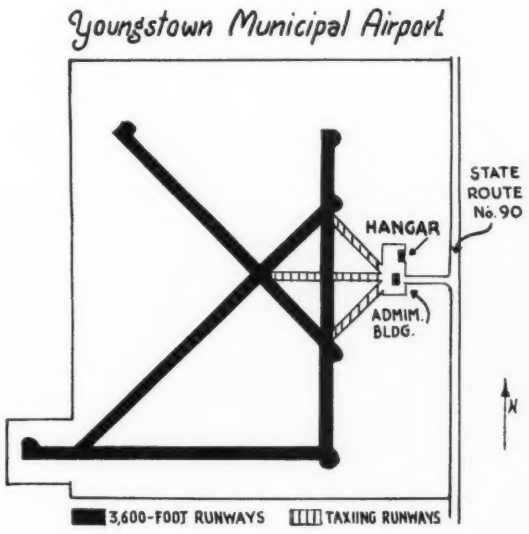
Form for curb of porous drain along runway. E. S. Turner, project inspector.

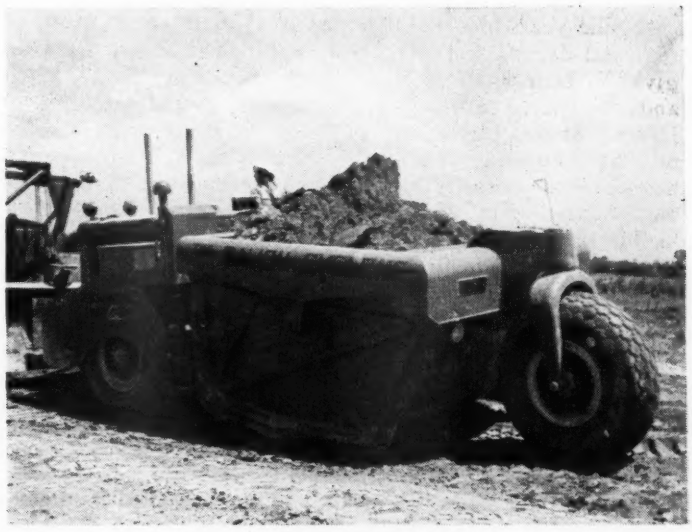


In foreground, reinforcing for concrete turning radius at north end of runway.

Six-Hundred-Acre Airport

Design and construction details of an airport designed to meet any requirements that may arise within the next fifty years and costing two and a half million dollars.





One of the Cyclone graders.

tably shovels and trucks, were kept going 24 hours a day, and the other machinery was often worked for 16 hours. In many instances, according to Mr. Turner, equipment worked perfectly, despite inexperienced operators, for 48-hour periods or longer with shutdowns of only a few minutes.

Grading was so designed that none of the four runways would have any grade over 1.34 per cent. The runways are being paved with bituminous concrete, and particular attention is being given to underdrainage and foundations in order to care for the heaviest airliners of the future. Judging from recent strides in aviation, 50-ton airliners are not many years away, and some of the most recent Army bombers weigh as much as 70 tons.

There are three runways 3,600 feet long and one 3,850 feet long, providing east-west, north-south, northeast-southwest and northwest-southeast directions. The runways are 150 feet wide, and each has a turning radius at the outer end that is 300 feet in diameter. From the high to the low sides, the runways slope 6 inches to header curbs with French drains. Lateral or cross diagonal drains are 60 feet apart, and discharge into the drains at the side of the runways. For the lateral drains, 6-inch "skip-pipe" (a flat-top drain tile that permits rapid drainage) is used, covered with porous backfill. Catch basins are placed at 500-ft. intervals, and 20-inch sewers carry off the rain water.

Previous to laying the runway surfacings, the subgrade was smoothed with power graders and rolled with 12-ton rollers. Two 4½-inch courses of slag were then placed, leveled, rolled and tied in with No. 7 slag. Five 10-ton to 12-ton rollers were used on this work. A binder course, 1½ inches thick, of No. 34 slag and T-60 bituminous material was placed on the consolidated base course. Topping it all is a 1-inch wearing course of No. 6 slag and T-60 bituminous material. For the final surfacing, three 12-ton 3-wheel rollers and two 12-ton tandem rollers were used. The turning circles at the ends of the runways are surfaced with reinforced concrete.

Top soil was saved from the excavation work and is being spread over the area between the runways; once sod is established, the airport should get a high safety rating, as there are no buildings and no trees to prevent a low-altitude approach from any direction. A modernistic administration and passenger building, built from a design similar to that used at New York's North Beach Airport, will complete the project.

A resume of the amount of paving and surfacing material utilized gives a good idea of what is necessary for a modern airport. The concrete surfacing of the turning circles amounted to about 48,000 square yards; the four runways total 2.72 miles in length and have an area of 49.6 acres, equivalent to nearly 250,000 sq. yds. of surfacing, and required 120,000 tons of base material and 22,000 tons of concrete surfacing.

BEFORE—Conditions like these were common throughout town.

Cooperation and Organization

By ROBERT M. LINGO

Resident Engineer for Scott & Scott, Engrs., Lincoln, Nebraska

FAIRMONT, Nebr., a town of about 750 people, is located in that part of the country which for the past nine years has suffered greatly from the depression and drouth. For nine years nature has failed to give the farmers of that community a "square deal" and crops have failed time and again. Normally the farmers of this community in south-central Nebraska produce corn and wheat. Nine years with poor crops has made the farmers look to some other source than the land for their living. But the towns and villages in this section have no industries to absorb the extra men; in fact, when the farmers cannot buy new materials the store keepers and lumber yards and business in general are on the down grade, because the farmer is the primary source of income here.

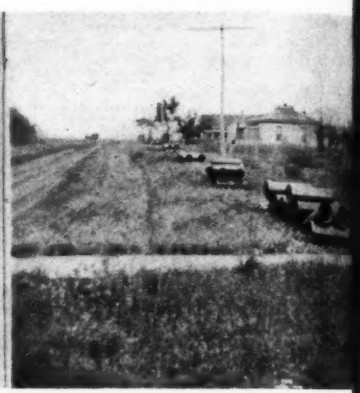
Fairmont has no industry other than a widely known garage—filling station—truck stop-cafe. Therefore, it fell upon the village to do something that would give employment to the workers of the county.

Community auditoriums, city halls, and other public buildings were common throughout the state as relief projects; so a community hall was promoted in Fairmont. However, a rain fell of such proportions that the people suddenly realized that the town was very flat and badly in need of storm sewers. Attention shifted from buildings to sewers. But with the rain gone and the people back to normal, knowing how rare rains of storm proportion were, they began to think again. Then rumors came into town of the failure of some auditoriums due to insufficient funds, no interest, heating expense, etc., and the city was ready to throw the relief question back to the county officials.

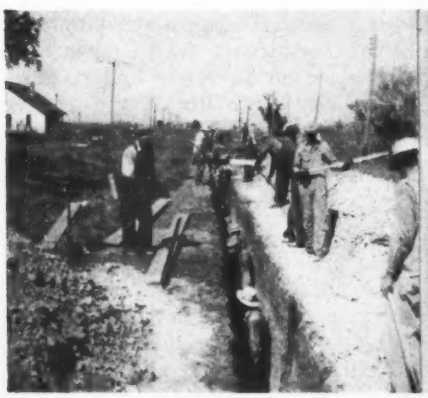
The city attorney then called upon Wardner G. Scott, a consulting engineer of Lincoln, Nebraska, and the idea of sanitary sewers was aired out. Fairmont was without sanitary sewers and without means of disposing of sewage; the city is more than five miles from any stream at all, so that a sewer system would of necessity have to end at a disposal plant. In this respect the city was very fortunate in having on its payroll a very capable man, E. M. Rose, who was handling the water and light departments and who could look after a disposal plant satisfactorily without necessitating hiring additional help.

A caucus was called and the citizens were talked to by the city officials, county officials, W.P.A. officials, and engineer. These talks outlined the relief question and necessity of Fairmont supporting some project. The engineer showed the benefit, necessity, and labor involved in a sanitary sewer by showing the amount of labor—paid for by the federal government—compared to the slight amount of materials needed to be provided by city funds. An informal vote taken at the caucus showed that the sanitary

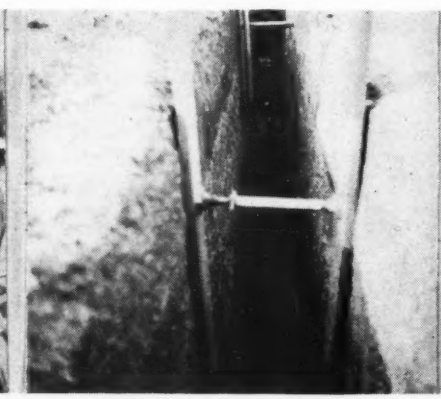
WPA furnished men.



The city bought the pipe.



Digging the trench.



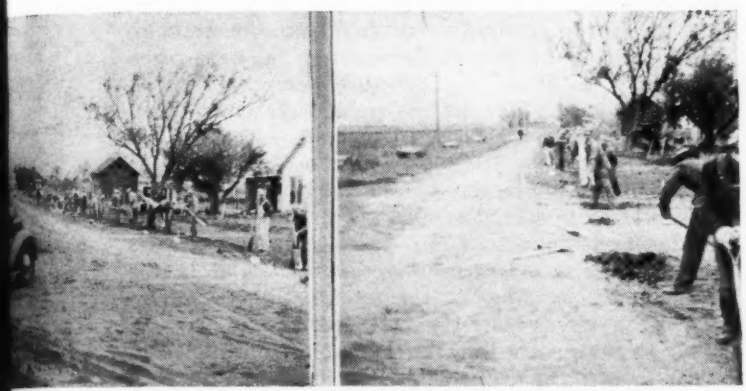
Bracing to prevent caving.

Tunnels saved some very deep digging.

Help in Sewer Construction

How hearty cooperation of W.P.A., engineer and city officials completed a sewerage system and disposal plant which, although not originally popular, won the approval of the taxpayers.

AFTER—Conveniences like these are now possible.



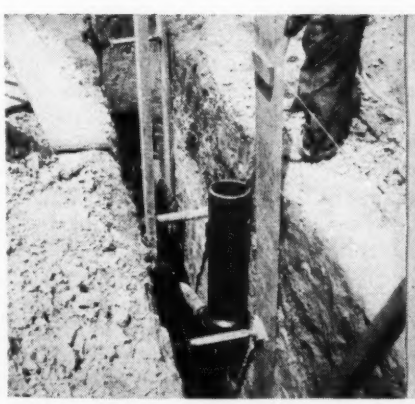
Men with spades were spaced about 10 ft. apart.

sewers were definitely not popular. Thereupon the city officials dropped all mention of relief work at all. As time went on people talked it over and it was discussed in women's clubs, on street corners, and at other informal meetings. Then in April 1939 an election was held at which the sanitary sewer question was formally put before the people. By this time the merchants and other influential people, including the town's only large business man, had worked for the project and it carried at the election by a vote of 191 for it and 164 against it. Still a rather unpopular project but liked enough to make it possible.

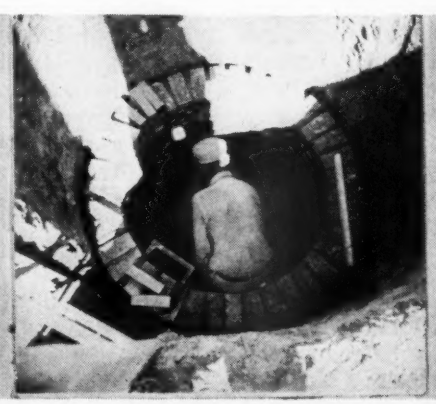
By the first of May 1939 the W.P.A. had made final arrangements and men were slowly transferred to the job. Within a few days the W.P.A. had gone outside their area and hired a very competent superintendent—John L. Deffenbaugh—who had built sewers all his life, many of them as a contractor, and worked in all sorts of soil conditions. This man and the resident engineer on the job were the only two men who had ever seen a sewer construction job. None of the W.P.A. officials connected with the job; none of the city officials; and none of the more than 200 men and foremen had ever seen sewers built.

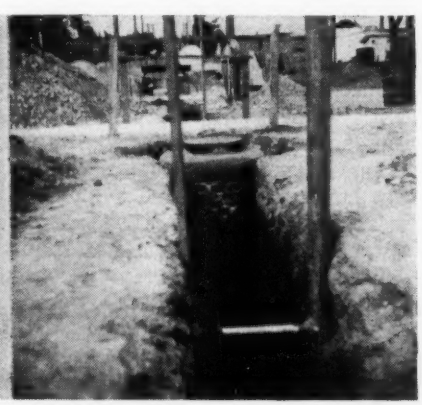
Mr. Deffenbaugh's job began at once. Since he had no experienced men, he had to organize the workmen into teams to dig ditch, lower pipe, yarn and calk joints, and do other details. Crews had to be organized to clear the way of brush, weeds, road blocks and other obstructions. Materials had to be hauled and stored where they were handy and available. Two men were broken in as bookkeeper and material man. Books were set up to keep account of the 78 car loads of materials used. Men who had never handled engineering materials had to be taught what was needed daily and what was used only on special occasions. Foremen were "made" and tool houses and latrines built. At the height of activity there were 197 men working daily, with two shifts on the job, in a town of 750 people. Since these men came from all over the county—some as many as 35 miles away—shifts had to be selected so the men could cooperate in riding to work as well as working on the job.

Comparison was easy because other sewer jobs were soon started nearby. This job at Fairmont stood out, first of all, because Fairmont city officials had hired an engineer who did not believe in skimping on anything. The city realized that paying an engineering fee to have a resident engineer actually on the job is a sound investment. The resident engineer acted as liaison officer between all parties concerned. He obtained all right-of-way agreements, made all necessary surveys, kept all permanent records of the work, checked all construction work and inspected all materials for the benefit of the purchaser. The city and the W.P.A. officials felt that it was his duty to know about everything that took place on the job. The resident en-



Lowering a pipe into the trench.





Brick manholes were built at all junctions and corners.

gineer was given a copy of all correspondence; whether from the city, W.P.A. officials, engineer, or material supply men. Thus the resident engineer was a key when any information was wanted as to work accomplished, work to be done, location of materials, money spent, money to be spent, etc. He was the source of information as to the status of the job at any particular moment.

The engineer, with the superintendent, saw that all materials were on hand at the proper time and no workmen were kept waiting. When the job was completed the engineer prepared a map showing the exact location of all details of the sewer, including the location of all wyes, and other connections to the sewer. The engineer also staked out the work as it was needed and this was done immediately without waiting for an engineer to come from some other job. Any material found to be questionable was inspected and passed upon immediately before it was unloaded. Thus often saving the expense of unloading and reloading if it were found unfit for use.

Credit must be given the city council for their work on this project. These men were always more than willing to give their time and energy when asked; they made trips out of town in the interest of the job, and though they were willing to cooperate, no man was given a promotion or special favor of any sort because of "political influence" with the city officials sponsoring the job. At times, when questions came up wherein political influence might have taken a hand, the city officials deliberately stayed away from the conference in order that they would not be involved. The writer has been on work where city officials spoiled an otherwise smooth running job. On this particular job the officials often refused even to recommend a man for a particular job when the superintendent—being a stranger—asked which man to select. The city officials had their inning before construction commenced. They said definitely that clay pipe should be used throughout the job. They said also certain equipment should be used in the disposal plant; and they passed on all specifications. From then on the city officials acted only when specifically called upon. Questions such as which local machine shop or garage to patronize were left entirely to the superintendent. In the layout of the work the officials at no time tried to tell the superintendent which streets to work on first, but left the organization of the work strictly up to him to handle best to suit working conditions.

When extensions were considered the city council called in the resident engineer, the job superintendent and the W.P.A. officials. Extensions were then discussed with all representatives present. If found feasible the work was then agreed upon and the engineer and superintendent instructed in writing to proceed with the extension.

It was interesting to note that the entire job consumed some 150,000 man hours, yet there was never a day when men did not work because of lack of funds, materials, or organization. Weather alone stopped the men, and then they were given their choice whether to work or not.

The original plan called for some 27,000 feet of sewer lines and met considerable opposition, as evidenced by the vote. However, the job progressed smoothly, with very little friction, and much more rapidly than people thought it would. Rumor was that the job would last three years, yet by the end of the ninth month the job was completed, including some 6,300 feet more sewer than planned originally. People who fought the project were by that time asking that it be further extended because it provided employment, served a needed service, and was no inconvenience. At no time were the streets or alleys closed long enough to inconvenience people. Only when a sudden extreme snow storm caught the work was dirt left piled in one place for longer than two or three days.

The sewer system involved some 33,258 feet of lines. All mains were 8, 10 or 12-inch clay pipe and some 3,000 feet of 4-inch service lines were laid to bring the sewer to property lines. In places where the main was extremely deep the service line was raised to eliminate deep connections. The town is located on a slope that makes sewerage easy. The alleys are all parallel and run with the general slope of the ground surface. This means that one intercepting line could be laid across the south edge of town, and mains run straight north from this line through every alley. With the grade selected the lines often would run as much as 2,000 feet with the deepest section about 12 feet and the shallowest section 10 feet. No drop manholes were needed and only two basements in the entire city were too deep to have a sewer outlet. A wye was placed at every lot where a house was located or at every lot which seemed logical for future building; in all 665 were laid. Manholes were placed at every street intersection and in the center of the long blocks, thus eliminating the necessity of sewer rods more than 250 feet long.

The sewer system leads to a pumping station which raises the sewage to the highest point of the disposal plant, making only the one pumping necessary. The treatment plant included a Dorr "clarigester" for primary treatment. The depth of sewer excavation ranged from 6 to 20 feet, with an average for the 33,000 feet of 10.26 feet. The entire job was W.P.A. labor, with only the engineer being paid from sources other than W.P.A. Digging trench 20 feet deep by hand means handling the dirt in three stages, which is a slow process, but with good organization it meant only a slight slowing down of output. A ten or twelve foot section was dug to grade and then an equal amount tunneled. This meant a considerable saving in dirt handled and the roof of the tunnel provided storage for excavated material when operating in narrow places.

The city bought all pipe for the job. W.P.A. furnished all other materials including manhole bricks, rings and covers, and cast iron steps. The manholes were four feet inside diameter at the bottom and to a height of four feet, tapered to 26 inches at a height of seven feet, and continued at that diameter to the top. All sewers were laid straight between manholes. At one place a light was seen through intermediate manholes for a distance of over 1,900 feet of 8-inch pipe.

This project has been a good example of what can be done with good cooperation and organization. Starting such a project with over 200 inexperienced laborers, and only an experienced engineer and superintendent, was a big undertaking. Yet within ten months 150,000 hours of labor had been expended, the town completely sewered, a disposal plant built and everyone—including taxpayers—was happy and content.

Much credit is due Mr. Deffenbaugh, Mr. Rose, S. E. Stevenson, the mayor, and L. J. Williams, W.P.A. area engineer, for their assistance and cooperation, which were important in carrying on the work so efficiently.

The Editor's Page

Airports by the Thousand

The first world war gave more of an impetus to the growth of aviation than anything that had ever happened before. Thousands of planes were built and thousands of aviators trained that otherwise would not have flown for many years to come, and the possibilities of the plane were developed more rapidly than would have occurred in peace times.

It seems probable that this second world war will have an equally stimulating effect upon aviation. When this war ends, tens of thousands of aviators and planes will be out of a job; and plants built for the purpose of constructing planes might more profitably be used to continue to do so than be scrapped, and should be able to turn them out in quantity at much less than the present cost. Small planes for private use are already being sold for only a little over a thousand dollars, and automobile manufacturers in this country, who are contracting to make airplane parts for the government, may be expected to turn out airplanes for private purchasers as cheap as their automobiles.

The chief problem seems to be providing air ports for the tens of thousands of private planes. Parking places for automobiles is enough of a headache for city planners and officials; the problem of parking and housing an equal number of airplanes offers an opportunity for someone with a practical imagination to make himself famous if not rich.

Meantime preparedness for war aviation and that to follow call for the construction of several thousand airports of all grades; a few score to accommodate the scheduled planes, a few hundred of medium size, and thousands for private itinerants. The Federal government speaks tentatively of 4,000 as an immediate need. It therefore behooves city engineers and others to inform themselves concerning the latest plans and construction details of the several classes of ports in preparation for the demand.

This is our reason for devoting a large part of this issue to the subject. Other articles dealing with practical construction details will appear in following issues.

Water Supply and Waste Disposal for Camps

Another problem connected with the preparedness program is presented by the new camps being built for draftees and other military forces, in providing them with water and disposing of their sewage and refuse.

In some cases, where they are located near municipalities, the municipal water distribution system can be extended to the camp and its sewage and refuse can be disposed of along with the city's. But before a city agrees to such a plan it should make sure of its ability to meet its demands. Such data as are available indicate that the sewage and refuse from thousands of men in camps is greater in amount and more difficult to dispose of than that from a similar number of citizens. Can its sewage treatment plant and its incinerator take on the additional load without calamitous results? And can it supply the required water without seriously depriving its own citizens and crippling its fire protection?

If the camp must make its own provisions, then the designer should take into consideration that the conditions differ from those with which he is familiar in his municipal practice. Several articles in this issue aim to help in solving these problems, especially the one on page 28, "Water Supply for the Army," the estimates for water consumption serving also for the amount of sewage to be provided for.

Improved Highways an Important Element of Preparedness

The English weekly "Highways and Bridges" is emphatic about the importance of highway traffic during the war. Railroads are limited in their traffic capacity by the rolling stock available, and one bomb may put an entire line out of commission for days, while all kinds of motor vehicles can be used on the highways, and use detours during the short time required for repairing a bomb hole. Says this paper: "The necessity for food rationing is due as much or more to the shortage of means of transport as to shortage of supplies. Because the railways own or control the principal ports, innumerable small ports have been undeveloped and are without transport facilities to serve them. We are told, and there is probably some truth in it, that whole cargoes of foodstuffs are deteriorating or have already gone bad for want of transport to get them away. How invaluable a highly developed road system would be now! . . . The present experience should bring home to everyone how vital a part transport plays in the affairs of the country—it is, in fact, its jugular vein."

We believe that our government realizes the importance of more highways; but perhaps the Federal and especially the State officials are not paying sufficient attention to putting all existing highways into the best condition for carrying the greatly increased heavy traffic they will be subjected to. In some states, at least, many of the bridges are not safe for carrying heavy trucks, to say nothing of the still heavier war machines that may need to use them.

Also the Army General Staff asks for cooperation of State and city officials in a movement to "formulate, and have constantly available, recommendations for the best routes to use, to arrange for the proper marking of these routes, and to provide for traffic control in the execution of the plan. . . . Push the simplification and unification of traffic rules among the various States on the grounds of National Defense." The Army is using the Automotive Safety Foundation, Tower Building, Washington, D. C., as a central agency for contacting the proper personnel to render or receive assistance in these matters.

Snohomish County, Washington

Situated high above land obstructions and fogs, this square mile airport involves 2½ million cubic yards of excavation and, with runways, buildings and lighting, will cost over a million dollars.

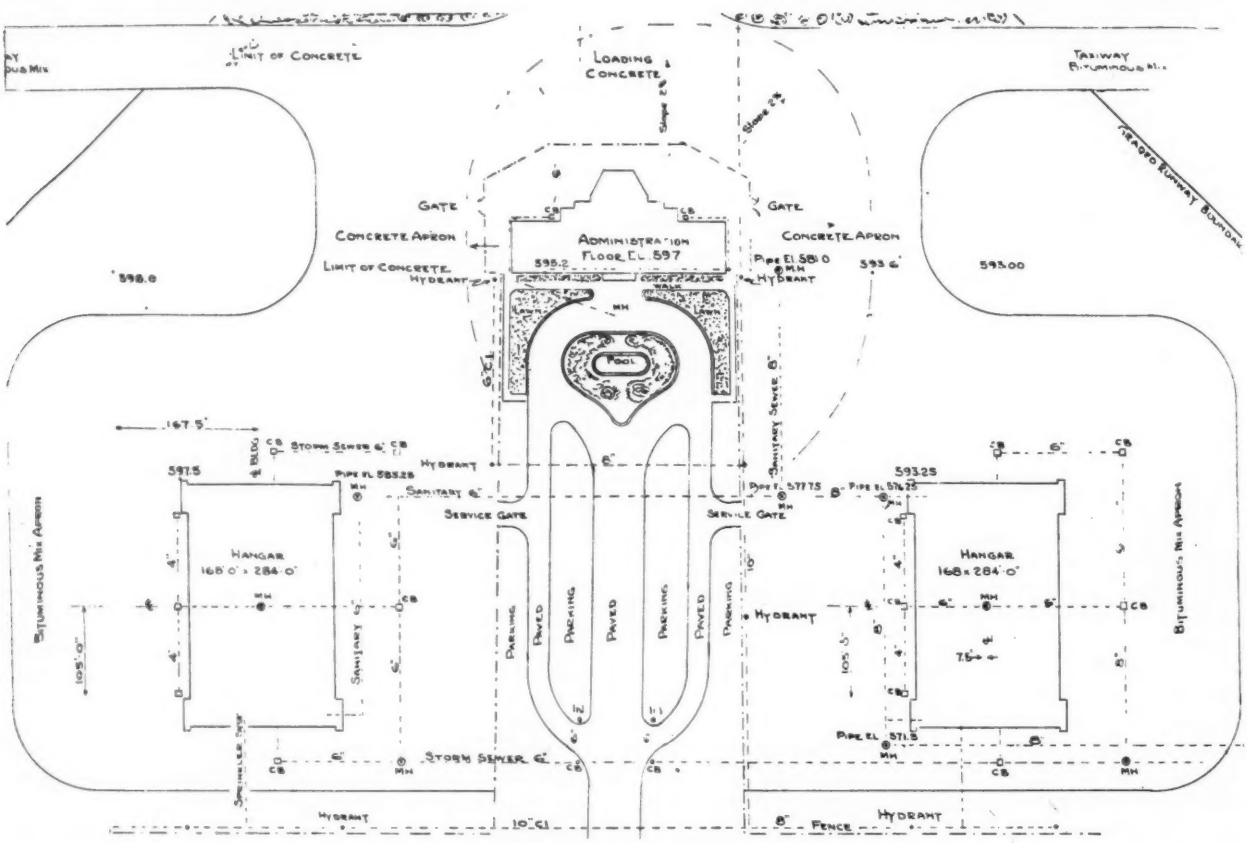
SNOHOMISH County Airport is situated eight miles southwest of Everett, Wash., and twenty-one miles north of the civic center of Seattle. It lies one and a half miles east of the shore of Puget Sound and at an average elevation of 585 feet above sea level. This places it above all major land obstructions and above most fogs, providing excellent all-year visibility.

The area upon which the airport is being built comprises 680 acres of land, being a mile square with one additional 40-acre tract. This land was rolling in character and covered with large stumps and small second growth trees necessitating very heavy clearing, grubbing and grading work. There has been moved to date approximately 2,000,000 yards of excavation and there is approximately 500,000 cubic yards yet to move. The task of clearing and grubbing the 680-acre tract of land for this airport was a large undertaking in itself as the tract averaged about 80 stumps to the acre. Between 300 and 400 WPA workers were given employment on these operations.

The field when completed will consist of three runways, each one mile in length and one runway 1.12 miles in length. The runways are each 800 feet wide with the center strip of 200 feet on the long runway hard-surfaced, and a center strip of 150 feet in width on the other three runways to be hard-surfaced.

The surfacing consists of 4 to 10 inches of pit-run gravel ballast which is leveled and given a prime coat of SC1A road oil upon which is placed a 2¼-inch bituminous road mix using MC2 road oil which in turn is capped with a seal coat using RC4 road oil and a very fine coat of pea gravel, maximum size ¼ inch. The north and south runway is now surfaced and being used as an emergency landing field by operating air lines and the Army and Navy.

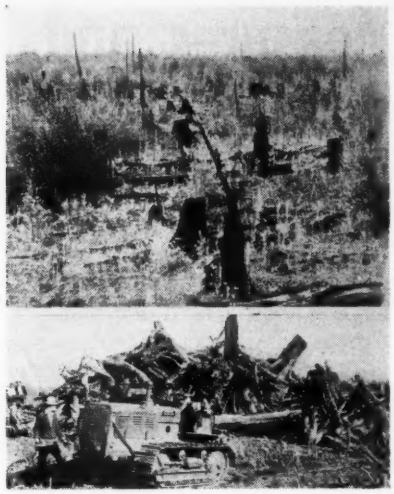
Lighting equipment and other flight facilities have been installed to facilitate emergency use of the field even though the other runways are not yet complete. A 24-inch revolving beacon has been installed on a 50-



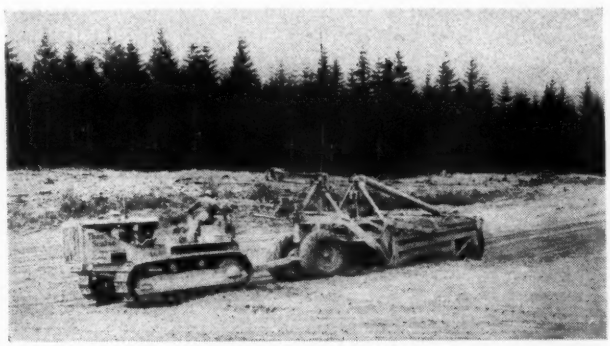
Layout of buildings and surroundings, Snohomish County airport.

Builds a Modern Airport

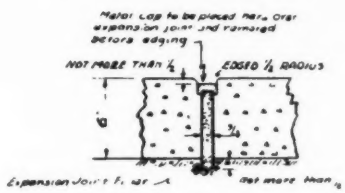
By CLARENCE HICKEY
County Engineer



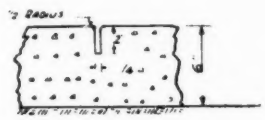
Clearing and grubbing the airport site.



"Carryall" scraper moving 8 yds. of earth at Snohomish airport



Expansion joint



Dummy joint

foot emergency tower and a lighted wind cone is also in use. The completed portion of the north-south runway is lighted by 55 flush type contact lights and by five range lights at each end of the strip.

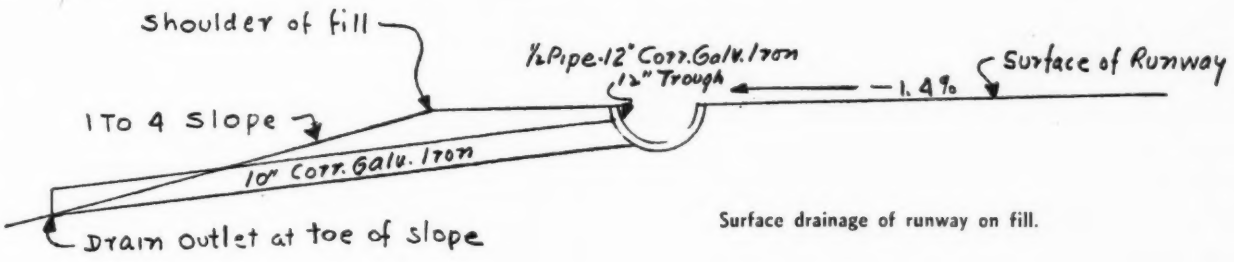
The C.A.A. has erected a radio station some three miles southwest of the field and a radio beam, operating on a frequency of 209 kilocycles, crosses the airport.

The present building program contemplates the construction of an administration building with a total floor area of approximately 40,000 square feet and two hangar buildings, each including adjoining shop area having an approximate area of 50,000 square feet. Work also will include the installation of a water and fire protection system which will cost approximately $50,000, the water to be taken from the City of Everett main along the Pacific Highway, which is approximately a mile and a quarter from the nearest corner of the field.

The work to date, notwithstanding the fact that it is a WPA project, has gone forward at a reasonable unit cost for the different items of construction. The dirt, including an average haul of 2,000 feet, has cost about $.20 a yard. The surfacing, including the ballast course, has cost about $.75 a square yard. Most of the dirt has been moved by dinghy trains consisting of 6 to 10 cars of 6-yard capacity, loaded by two 1½-yard power shovels; one a Northwest owned by the County and the other a shovel furnished by the WPA under several different rental contractors. Thus the WPA shovel is changed from time to time by reason of contract rental agreements with varying contractors. Most of the short-haul dirt was moved by tractors and carryall scrapers. There has been one such outfit on the job at all times and a second such outfit part of the time.

The County, so far, has furnished beside the land, one 1½-yard shovel; one RD8 Caterpillar tractor with drums; one 220-foot Ingersoll-Rand compressor; practically all of the ballast gravel delivered on the runway; all of the washed gravel for the back fill around drain pipes; all of the road oil and aggregate used on the hard surfacing; and also numerous and smaller items, such as plans and designs and miscellaneous equipment purchased in emergency cases.

The County has also furnished gas, oil and operators for all County-owned equipment. The County has spent to date approximately $250,000.00. The WPA has spent to date approximately $700,000.00. The original WPA set-up contemplated a total expenditure of $1,676,636 and a sponsors expenditure of $470,181. It is intended at this time that the County will ask the Federal Government to complete the grading and surfacing of the runways leaving the balance of the County funds now available to be used toward the construction of the buildings. It is the intention that the Airport will be a commercially operated field with the Army and Navy Corps making such use of the field as they may see fit.



Surface drainage of runway on fill.

Measures and Procedures to Prevent Sabotage of Water and Sewage Plants

By M. J. Blew

THERE is no need for panic or undue anxiety in regard to sabotage of water and sewerage facilities, but it is a wise precaution to consider the possibility of such happenings, and to plan to meet whatever may occur. Primary considerations should include personnel and determination of critical points in the system.

An inventory of personnel is desirable, particular care being given to elimination of any steps or measures that, by reflection or otherwise, may react unjustly against any employee. Such an inventory may also determine the qualifications of employees to act in higher positions in case of need. The mobilization of the National Guard and the calling to duty of Reserve Officers may create vacancies in important positions; and where possible, these vacancies should be filled by promotion. Therefore, the personnel inventory should include a survey of qualifications to fill higher positions, as well as a determination of the background of the men from the viewpoint of possible sabotage.

The study to determine points of weakness in a water supply system or other utility will generally develop a better and sounder knowledge of the every-day needs of the system, and may result in the realization of improvements long needed but overlooked, and in the adoption of better operation procedures. Among steps to be taken may be listed the following:

A study of the water and sewerage systems to determine all repairs needed to provide good service; determining the need for additional valves in water systems to permit cutting out of service any section of the distribution system; planning the connecting of dead ends to permit the effect of breaks to be localized; considering the needs of industrial areas, and furnishing mains of sufficient size to provide an adequate volume of water for operation, even under expanded conditions, and for adequate fire protection; organizing and training service and maintenance crews to meet emergencies beyond the normal; and careful inspection and checking of standby and automatic equipment. Standby and reserve equipment should be kept in first-class operating condition at all times.

The organization and training of crews for emergency work may well be a cooperative project among two or more neighboring communities. The pooling of personnel, ideas and equipment may provide numerous benefits.

Essential health protection equipment, as chlorinators, should be in duplicate, or extra portable or emergency units should always be available. The supply of liquid chlorine should be protected, and an ample amount should be kept on hand to meet emergencies. Other essential chemicals as alum and lime should be stored safely in sufficient quantity. A sufficient supply of other materials should be stored safely. Pipe, fittings, valves, sleeves, couplings, joints and all the other details of needed construction and repair material should be stored in ample volume in protected and accessible points. Reserve pumping units, always very valuable, may be indispensible in emergencies. Centrifugal pumps of the portable type are perhaps best suited for this. They may be mounted on wheels for trailing, cr on a stand or skids.

Other procedures to be considered may include flood lighting of water and sewerage plants, dams, pumping stations, chlorinator installations and similar places. Where electric power is not available, portable flood lighting plants which operate very economically on gasoline, kerosene or diesel fuel, or carbide lights, may be used. Effective lighting is an important safety measure.

Treatment plants may also be protected by the use of fences of the kind which make entrance difficult. Combined with lighting, these make effective protection possible with a minimum of watch or police personnel. Tentative arrangements should be made with local police departments, state police or other law enforcement agencies.

Sewer Pipe a 16 Million Dollar Industry

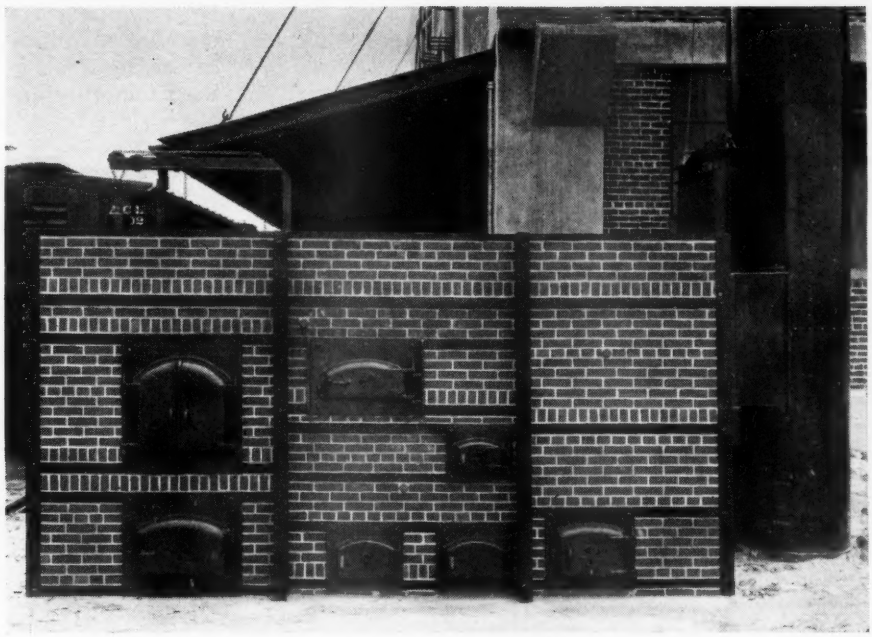
Preliminary figures of the 1939 Census of Manufacturers show that the 65 large establishments making sewer pipe last year produced 1,065,405 tons of pipe valued at $15,516,658, and reduced their stock by 31,856 tons, giving a total value of over 16½ million dollars. "Kindred products" manufactured by these establishments were estimated at $4,331,689. The output increased over that for 1937 by more than $2,000,000. The industry employed 6,406 wage earners in manufacturing and paid them $6,817,738.

This was an increase of 2.2 percent in number of men employed and of 8.7 percent in amount of wages paid as compared with 1937.

The 1939 Census of Manufactures is the first census for which employees of sewer pipe and kindred products manufacturing plants who were primarily engaged in distribution, construction, etc., activities have been called for separately on the schedules.

Technical Papers in England Continue Publication

"Business as usual," or as nearly usual as possible, seems to be continuing in England. (A drug store in London displays the sign "Bismuth as usual during altercations.") This applies to the publishing of technical papers, several of which continue to reach us, though somewhat late. On October 25th we received "The Surveyor" of October 4th and carrying as much advertising as a year ago, apparently. By the same mail we received the October 2nd issue of "Highways and Bridges," which carried the notice: "Owing to circumstances over which we have no control we have had to vacate our Chancery Lane offices—a bolt from the blue in fact, and fortunately out of office hours. In the meantime, we are receiving generous hospitality from our printers . . . to which all communications should be addressed."



Stoking doors of Morse Boulger destructor at Jacksonville, Fla. Type installed by them at airports.

Refuse Disposal for Airports

By A. E. STILSON
President, Morse Boulger Destructor Co.

EXPERIENCE has proved that the majority of the refuse about an airport is highly combustible material. This fact is obvious when we consider that the refuse may result from the servicing of planes and engines, the rebuilding of planes or their repair; and, in addition, will include the discarded heavy wrappings provided to protect aiplane parts in transit. The personnel about the field is normally a very limited source of waste; however, when the day comes that the field is required to perform at full capacity, the refuse production by the personnel will become a sanitary matter of importance. The men necessary to maintain planes at a base will be about five times as great in number as the pilots and observers.

In estimating the problem of waste disposal for the military airport, or an airport that may be used by the army, the engineer should consult the War Department, Plans and Training Officer, Aviation Section, or his Corps Area counterpart. This officer can give an estimate of the personnel and of the number of planes that it is expected might be based at this airport at any given time. The number of the ground garrison will be known to the Corps Area Commander, Aviation Section. The civilian employee personnel will, of course, be known to the city authorities. It will be difficult to make a guess as to what volume of waste may be contributed by the planes themselves.

It is unlikely that any accurate data could be obtained from commercial transport air fields; and if obtained, such data would be only an indication and not something to be relied upon. It is necessary, therefore, that the engineer in charge of design consider his problem as unique and when he has exhausted his ingenuity in obtaining a unit basis for estimating, he will have to make his own decision; using an adequate safety factor depending upon his opinion of the reliability of the basic data. A safety factor of at least 50% is suggested in order to care for the fluctuations that are bound to arise.

The nature of the inflammable materials to be destroyed which originate from the planes themselves must be considered. Oil-soaked rags, paper, and wood must be destroyed within a short period after production to avoid the possibility of spontaneous combustion and disastrous fires. Furthermore, they must be destroyed by being burned in a controlled manner. An open-air fire is not safe. Inevitably, where planes are being rebuilt, there will be a certain amount of metal which will finds its way into the refuse. This may be in the form of filings, cuttings, or small bits, and may be extremely dangerous. These metals may be aluminum, magnesium or compounds containing them, and once ignited, these make a first class Fourth of July blaze, with nothing to be done about it until they have burned themselves out. When these substances are to be destroyed, the incinerator should be reasonably free of ash and so arranged that plenty of air can get through the grates in a hurry.

Garbage, particularly if it originates from army messes, may contribute unpleasant conditions. There will be about one pound of this material per man per day. Army garbage does not contain the dry rubbish that a municipal engineer is accustomed to. It is not normally capable of sustaining its own combustion, and in many instances it will not stay on the cast iron grates but will drop through to the ash pit. Good design, therefore, for an airport destructor or incinerator, provides a portion of the firebox with a garbage

Rear view of destructor shown on page 23

hearth, upon which this material may be placed, where it will dry without smothering the fire.

In designing an incinerator, a chimney should be provided. Airport officials should not be influenced by the almost universal cry of aviators that only a chimney less than 40 feet high will be permitted. Should the calculations indicate that a chimney 50 feet high is needed, it should be provided. It may be possible in some cases to find a hollow 10 feet deep, permitting a chimney 50 feet high and still only 40 feet above the flying field.

Such a hollow or depression might have another advantage. The incinerator unit need not be in excess of 10 feet high, and location in a hollow would permit trucks to dump their loads on the charging floor on top of it, from which place it is most easily charged.

Destructors are sturdy if well designed and properly built. In units capable of destroying as much as 1,000 lbs. to 1,200 lbs. of refuse per hour, there is no particular reason why additional expense need be incurred for a building to protect it. But an adequate concrete platform at the stoking level should be provided for the operator to stand on. In the winter, precautions should be followed to insure that it be drained to prevent freezing.

An incinerator will withstand reasonable shock and vibration but it cannot be expected to withstand movement of trucks upon its top. If there is danger of trucks rolling onto the top in charging, a charging chute should be used. If the top has to support only one man and a charge of refuse, a steel charging pan may be used instead of a charging floor, set into the concrete roof and amply drained.

In designing, the engineer must not forget that concrete depends for its strength on the water of crystallization. Concrete is not, therefore, a suitable substance to be used anywhere in connection with an incinerator. In building your incinerator, specify that only first quality firebrick laid up in first quality mortar be used for the lining. Be sure there is an air space or high grade insulating material between the firebrick lining and the exterior shell. If the shell is of steel, it should be at least 3/16" thick. If it is of brick, it should be at least 8" thick and faced on the outside with salt-glazed brick which can be kept clean.

The entire structure must be firmly bound with heavy vertical buckstays to resist the thrusts of roof arches, garbage hearths, and expansion and contraction stresses generally. These stresses should be brought to the buckstays by heavy horizontal angles or other structural members. It is foolish to attempt to save a few dollars by providing light structural frame work. Brick work in a furnace cannot be expected to offer material structural strength.

The average light casting of even the best grade is incapable of withstanding incinerator service. It pays big dividends in the long run to use very substantial castings of the finest materials for grates, door frames, charging openings and doors. All castings used should be designed for their particular service and fitted to their frames. Under no circumstances should castings exposed to heat, as door frames, be allowed to support brick work or other stresses beyond that of their own weight; and the weight of castings should not be carried on the brick work, but on the horizontal steel work to the buckstays.

If you have a problem in incineration in connection with work you are designing, PUBLIC WORKS Magazine will be very glad to help in any way possible and will recommend sources of information or companies to whom you may turn for precise information and assistance.

Accident-Prone Areas Studied on Ohio Highways

The 11,716 motor vehicle accidents reported to the Traffic and Safety Division of the Ohio State Highway Department during 1939 occurred on the approximately 16,000 miles of the state highway system. As would normally be expected, the distribution of these accidents is not uniform; variations in traffic flow and physical differences in the highway itself are factors which greatly influence accident frequency.

Generally, it may be assumed that a direct relation exists between the frequency of accidents and the amount of highway usage, which may be expressed as a rate per million miles of annual travel. While other factors may have a direct bearing on the accident experience of a particular section of highway, these factors, if present, will be indicated by the rate or index of accident frequency when compared to other sections with similar traffic and physical characteristics.

On Ohio highways during 1939, vehicular travel in terms of vehicle miles was estimated to be 5,156,196,955 miles, an increase of approximately 6 per cent over the preceding year. On this basis, the accident rate for rural state highways in Ohio was found to be 2.3 accidents per million miles of travel, and was computed by dividing the total number of accidents reported during 1939 by the annual vehicle mileage (in millions of vehicle miles).

While an accident rate computed in this manner does not seem unusually large, it must be remembered that each mile of highway with an average daily traffic flow of 2,700 vehicles, will aggregate a million miles of travel each year. Furthermore, a five-mile section of road with this amount of travel and an accident experience comparable to the average state rate, would probably have at least ten accidents during the year.

Accident rates were computed for individual sections of highway, based on reported accidents and highway travel for each section. In the event a particular section had an accident rate less than the state index of 2.3, the accident experience of this section was considered below average and would not be shown on the accident prone map.

Summaries of accident prone sections indicate that almost one-third of all reported accidents are concentrated on 4.5 per cent of the total state highway mileage, whereas this same 4.5 per cent, or 730 miles, accounts for only 14 per cent of the total annual travel on rural state highways.

Water Supply and Sewage Disposal for Airports

Aids for estimating the amount of water to be provided, including fire protection and peak demands. Capacity and types of sewage treatment plants and degree of treatment necessary.

STRESS is being laid on airport construction and there will be much activity in this field. In addition to army airfields, it is planned to construct some 4,000 local airports, by cooperation between governmental agencies and municipalities and counties. In this program, labor will be furnished through governmental agences, while the local communities will prepare plans, supply construction equipment and supervise the work. To assist local engineers, PUBLIC WORKS will publish articles covering important elements in design and construction, of which this is the first.

In an effort to obtain reliable data regarding water and sewerage design factors, inquiry was made of the Civil Aeronautics Administration, which replied as follows:

"The Civil Aeronautics Administration does not have specific regulations governing airport water supply or sewerage facilities. The majority of airport construction and improvement projects are sponsored by municipalities and the question of water supply and sewage disposal are matters of local concern and are so designed as to conform to the code requirements of the municipality. The number of personnel to be provided for either water supply or waste disposal is dependent on the size, location and facilities of the given airport and the personnel required are generally city employees.

"The Airport Section, through a technical development project, during the fiscal year 1942, probably will undertake a study of airport fire prevention and utilization of extinguishing equipment in connection with fuel storage systems and hangar fire hazards. At the present time hangars conform to local fire codes and to the recommendations of the National Underwriters as reflected through the insurance companies insuring the hangars and airport buildings. The Civil Aeronautics Administration does not have specific regulation on this subject."

Design Factors in Water Supply

Needs for fire protection and the demands of the personnel, both permanent and transient, will determine the design of water supply facilities as regards quantity. Quality should be beyond question, and facilities and need for treatment should be determined by conference with the State Board of Health.

Numbers of both permanent and transient personnel will vary with the size of the airport, the activity at it, as instruction, and the number of ships using it.

August Sauer, airport engineer of San Antonio, Tex., says: "The average airport has about 70 employees, ranging from the manager down to gas-boys, gardeners and porters." These are local employees, that is, they are exclusive of transients. They include Weather Bureau and Civil Aeronautics Administration employees, inspectors and examiners for flying licenses. In addition there are the employees of commercial lines, announcers, repair crews and others. To these 70 employees must be added the transients—passengers, those who come to see them off and visitors. As Mr. Sauer says, "When a ship is due to arrive or leave, the atmosphere is about the same as at a bus terminal."

In smaller communities, all of this will be on a smaller scale; army air fields will have a much larger personnel. A study of personnel requirements at 13 army air fields shows that the average personnel will average 2,350. Of these, about 700 will be service and operating personnel. Of the 13 fields, only two will have less than 1,000 men, and none more than 3,180. Four airports will have 175 planes based on them, and average personnel at these fields will be about 1,800 men, or 41 men per plane.

In any event, a careful study of the probable personnel should be made to determine the number to be provided for. Due allowance should be made for future growth and for peak loads. Wherever possible, design to permit future enlargements. This is most important in designing for sewage treatment, since such facilities once installed are difficult to enlarge or supplement satisfactorily.

The three categories of personnel to be cared for are: (1) Those who live at the field 24 hours per day; for these assume a consumption of 100 gallons per person per day. (2) Day workers who are on duty 8 to 10 hours a day; for these allow about 35 gallons per person per day if bath or shower facilities are available. (3) Transients, as visitors and passengers; for these allow 5 to 10 gallons per person per day, preferably 10 gallons. Mains should be designed to provide 2½ times the daily estimated consumption on the above basis; and fire protection should also be provided for.

The above data are not intended to state that consumption will, in all cases, reach these amounts, but they are intended to be a safe guide in the absence of other specific data.

Allowance may also be made for crowds attending air meets or other popular events. Some engineers design for these on the same basis as for football stadia or for sports events.

The cost of providing a water supply will influence to some extent the quantity provided; but every effort should be made within reason to provide an ample supply. Where water is brought in a pipe line from a neighboring city, the initial cost is often but little more for a line of ample capacity; where a local source, as wells or a small surface supply, is developed at the airport site, and ample capacity cannot be obtained at a reasonable cost, design should permit needed expansion later and ample storage should be provided. Fire protection requirements must also be included.

At some air fields, water is used for operating hydraulic gasoline systems. At army air fields, 50 to

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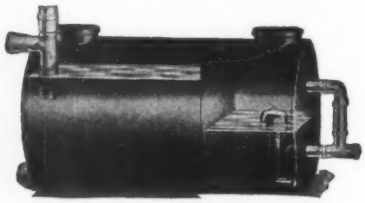
San-Equip Septic Tanks are recognized by health officials as standard equipment for unsewered areas. Now the improved Master Septic Tank provides even more satisfactory service.

The construction features of this tank insure operating efficiency. It also permits expansion in the system as need arises.



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100 gallons per minute are required for such facilities when in operation, and the pressure must be at least 35 pounds. Where these are not installed, a minimum residual pressure of not less than 30 pounds should be provided.

Data from army air fields show water consumption rates of about 100 gallons per person per day; also that the rate of use is very high at certain periods. At one typical field, the daily rate of water use varies from 5½ gallons per hour per man at 7:30 A.M. to 1½ gallons at 11:30 A.M., to more than 7 gallons at 3:30 P.M. Provision for such use should be made in the design. Where nearly all the personnel at an airfield are workers, a very large proportion of the water use will occur in the half hour before and after "quitting time." Adequate provision should be made in the distribution system and in storage facilities to meet these peak demands.

Fire Protection Requirements

While principal reliance in fire protection may be placed on chemical fire control equipment, including foam and carbon dioxide, water should be available in sufficient volume and pressure. The requirements and advice of the National Board of Fire Underwriters should be sought and followed carefully.

The use of high water towers or elevated tanks may be undesirable unless these are carefully located. If located at a distance from the hangars and administration building, mains of ample size should be laid to points of potential danger. Nearby streams or underground storage tanks may be utilized as auxiliary supplies. Gasoline engine driven pumps are desirable for this work; centrifugal pumps are probably best. The small gasoline driven centrifugal, 3-inch or larger, trailer mounted, is valuable. If electricity is used to operate such pumps, power failure must be provided against.

Geo. W. Booth, Chief Engineer, writes: "With reference to your recent request that we prepare an article for you dealing with the water supply requirements for fire protection at airports, please be advised that our standards on this particular feature of the subject are undergoing revision. Inasmuch as this work is being handled by a committee and their approval must be secured before we make any official pronouncement thereon, it will not be feasible for us to prepare this article at such short notice. In all probability we will be in no position to advise authoritatively on this matter for at least another month."

Sewage Disposal Data

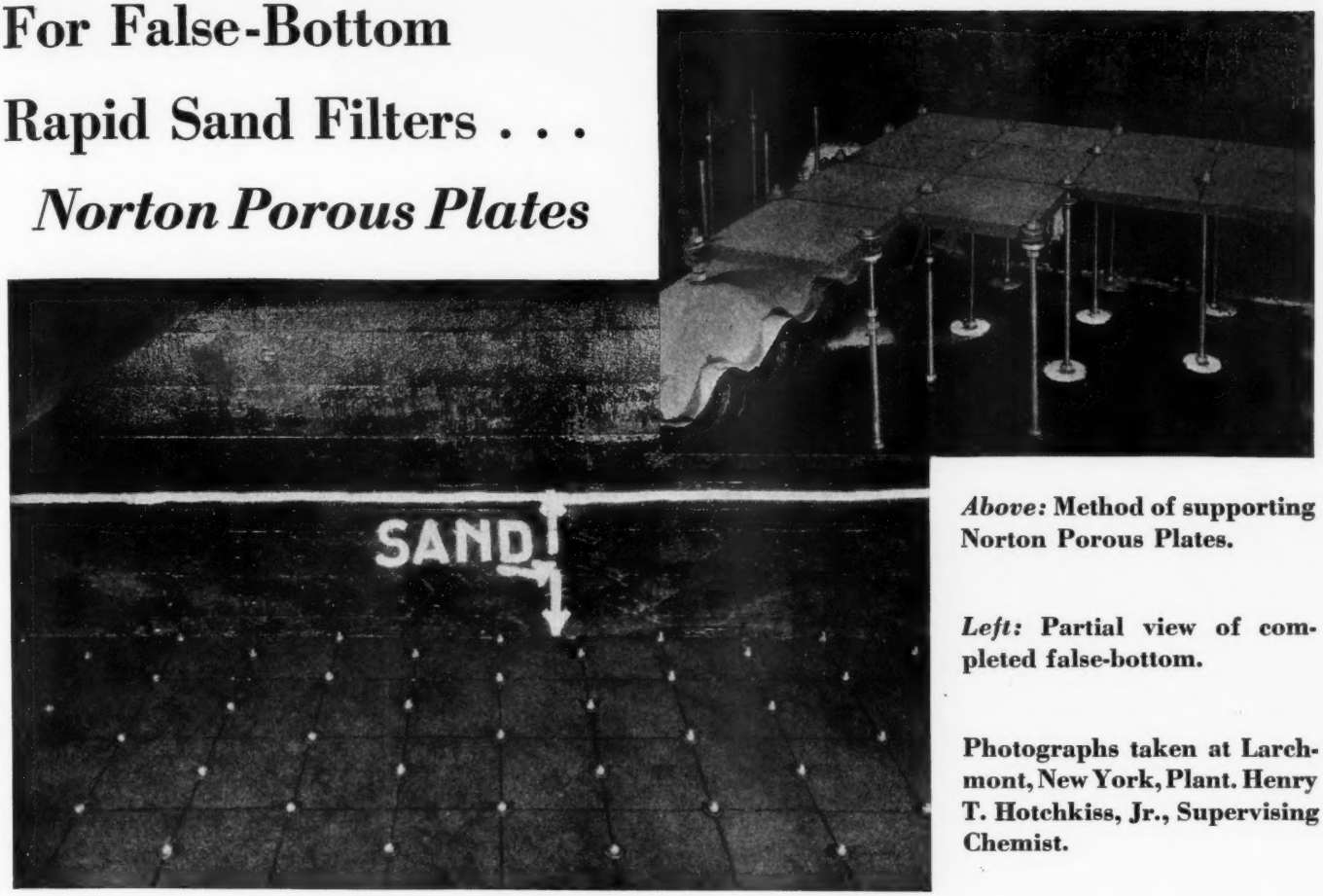
For sewers, usual design bases are used in regard to size, slope and distance between manholes. The probable quantity of sewage can be computed from the expected use of water, liberal provision being made for possible excessive flows. Design of the sewage treatment plant is important. Plant capacity should be amply large, yet not so large that during periods of minimum flows, excessve detention capacities will interfere with proper operation. Scant data are available on the subject of design. In forthcoming issues, PUBLIC WORKS will present some tentative plans for plants for airports.

Safe practice is to design the plant to care properly for the expected flow, with a reasonable allowance for error, and then to design so that needed future additions can be made while utilizing all of the existing plant. To construct sewage treatment devices for airports, where future growth is almost certain but wholly

(Continued on page 38)

For False-Bottom Rapid Sand Filters . . .

Norton Porous Plates



Above: **Method of supporting Norton Porous Plates.**

Left: **Partial view of completed false-bottom.**

Photographs taken at Larchmont, New York, Plant. Henry T. Hotchkiss, Jr., Supervising Chemist.

THE rapid sand filtration method of water treatment is an important problem of many municipal engineers.

The Camp process has introduced marked improvements in this system of filtration due to the use of Norton Porous Plates.

First, the inherent qualities of the plates make them peculiarly adaptable to this type of work. They are strong and uniform; and can be furnished in the desired structure.

Second, the patented Camp bottom is adaptable to old installations (see illustrations). This false-bottom design provides equal rates of flow of wash water through every square inch of bottom—an important factor in long life and efficient filter operation.

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NORTON POROUS MEDIUMS

Courtesy The Military Engineer

Old and new models of army mobile water purification units.

Water Supply for the Army

PROVIDING an army, in camp or in the field, with the kind of water to which the men are accustomed at home is a problem of great importance and often of great difficulty. There are two major phases of the problem. One is the provision of water for the troops while they are in barracks, cantonments or camps; and for fixed installations, such as supply depots, hospitals, air fields and air bases. The other is the supply of water to troops on the march, at maneuvers, or in battle.

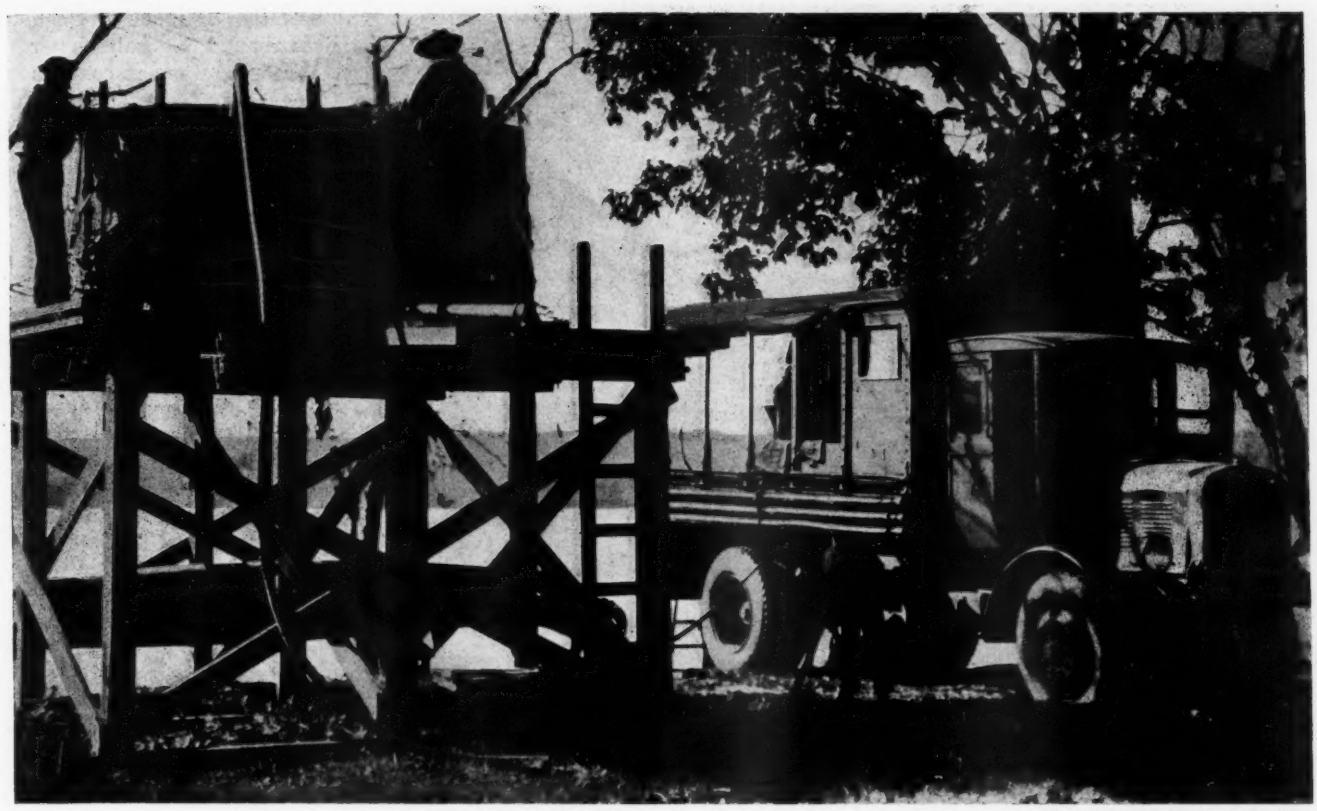
Camps and Other Fixed Installations

The general principles governing water supply and purification that apply to cities, towns and villages apply also to camps and other fixed installations. A post, a fort, an air field or a supply depot can be served by means of a source, a supply line, treatment works and a distribution system. There is one difference, as compared to municipal supplies: The population may be increased quickly, or decreased, and the useful life of the plant is uncertain. Provisions for these contingencies should be made. However, the present plans for expansion of the army are based on a program of at least 5 years, and it is most likely that for many years thereafter we will maintain an army of relatively large size.

The amount of water required per man is uncertain; data are conflicting, and much depends on local conditions. Dunham states that "given an ample supply, with no undue restrictions on the use of water and with average wastage, the quantity of water consumed in a permanent camp or station will vary from 50 to 75 gallons per person per day, but . . . lax water discipline may result in the consumption rate being as high as 200 gallons per capita per day." These figures are based on a thorough study of army records and are perhaps the most reliable that are available. Considering the possibility of waste and of expansion of personnel, the designing engineer should provide the maximum amount consistent with reasonable cost. Except for temporary camps, provision should be made for at least 150 to 200 gallons per day for the design population.

Peaks of water consumption are probably more marked in such army posts than in average municipalities, due to the regular habits of the soldiers. The greatest load probably comes in the late afternoon, after formations have been dismissed. At one camp of 2,500 men, minimum day consumption was about 1½ gallons per man per hour (at 11 A. M.) and maximum consumption was about 8½ gallons per man per hour (3:30 P. M.). Consumption per man per day was 95 gallons. To provide for such a heavy load, mains should be amply large and sufficient storage must be at hand to care for the demand. It is believed that mains and storage facilities should be designed to furnish about 20 gallons per man per hour; and perhaps more in hot climates. Few reliable data are available on this and this estimate is, in reality, little more than a guess based on actual observations.

It is the usual army practice to provide toilets for 5% to 10% of the command, and commonly about 8%



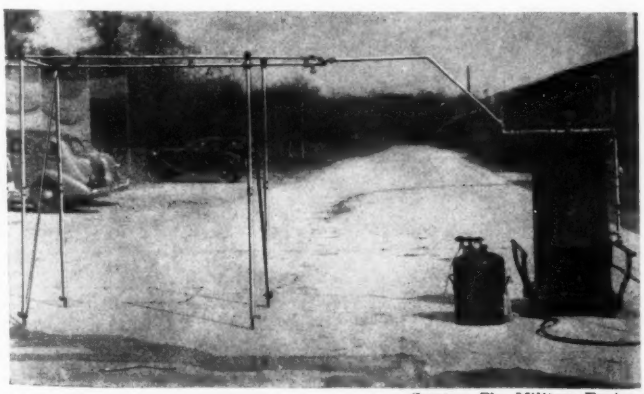
Courtesy The Military Engineer

Mobile purification unit; temporary canvas tank for water storage.

Problems confronting engineers who are called upon to provide water for the army in camps and in the field and the solutions available.

are installed with additional urinal space of 5% to 8%. Lavatory facilities should be provided for 12% to 20% of the command, usually about 15%; and showers should be provided for about 5% to 8%. In other words, per 1,000 men, there will be about 80 to 100 toilets, 150 lavatories, and 50 to 80 showers. During the hour of maximum use, all of these will be operating practically continuously.

Provision must also be made for storage for fire extinguishment. The fire need will depend upon the type, size and spacing of buildings, and the use of tents. With wooden buildings, Fire Underwriters requirements are probably sufficient; less may be needed for tent camps, but tent camps may be converted to more permanent construction at any time. Fire reserve should be in addition to peak load demands.



Courtesy The Military Engineer

Portable shower bath set-up.

Treatment of the water should be provided to meet modern sanitary engineering standards and to comply with regulations of the State Departments of Health. Design should be such as to make the production of safe, palatable and attractive water the normal function of the plant. Operators of fixed peace-time plants are usually well-trained and capable, and there should be no excuse, in view of the future plans for army expansion, for the use of any but well-trained and reliable plant operators in the newer plants for camps and cantonments; nevertheless, so far as possible, provisions should be made in design to eliminate a hazard from unskilled operation.

The Quartermaster Corps is responsible for the construction, maintenance and operation of water purification plants and distributing systems, and for the quantity and quality of water at all stations, camps and installations. The Medical Department, being responsible for the health of the troops, is charged with making surveys, studies, examinations and recommendations to insure the continuous production of safe water.

Temporary Camps and Semi-Permanent Installations

This classification covers a wide range of conditions, so that much will depend upon the immediate situation and no specfic recommendations or statements can be made. In general, where water is distributed by pipes, and bathing and toilet facilities even of a rough nature are provided, water use will aggregate 25 to 35

Courtesy The Military Engineer

Mobile filter unit in operation; milk cans being filled.

gallons per person per day. Where there are no pipes, and water is distributed by trucks or water carts, about 5 gallons per day will be consumed for drinking, cooking and washing. For animals, under such conditions, 10 gallons per day should be provided for each.

Water supplies for installations of this nature are the responsibility of the Quartermaster Corps, if they are not located in the Combat Zone, in which case they will be under the charge and responsibility of the Corps of Engineers.

Field Water Supplies

In bivouac, that is, field camps, and on the march, about 2 gallons per day will be required per man and about 10 gallons per animal. In combat, both can get along on less, if necessary, though every effort should be made to provide the above amounts. In combat, men can get along for a maximum period of three days on about 2 quarts per day, and animals on 3 to 5 gallons per day.

Assuming that marching and bivouac are in the combat zone, the Corps of Engineers is charged with the responsibility of procurement and supply of water to divisions and, where practicable, to smaller units. Beyond this, the individual organizations are responsible for their own water supply, with the Medical Department having supervision over treatment, which generally consists only of field chlorination.

This policy of no one being directly responsible for the quality of the water, aside from its safety through chlorination, has not been satisfactory. In the field, water supplies must be hauled up from Engineer water points, or local supplies must be utilized. Engineer Corps purification units in the past have not been very effective in producing an attractive water, and no equipment for improving the quality of local supplies has been available until recently. As a result, turbid, odorous and overchlorinated water has resulted.

Under World War conditions, the following general method of supply was followed: The water trucks of the Corps of Engineers Water Supply Battalion or Regiment hauled water forward to distributing points in the rear of each division or brigade, locating the water points about 2 or 2½ miles in the rear of the front line. Organization water carts hauled water forward from these to the troops.

A battalion of about 800 men requires about 1,800 gallons per day. Water equipment consists of a 36-gallon Lyster bag for each 100 men, or fraction thereof, and one 110-gallon mule-drawn water cart per company, or 4 to the battalion. Thus sixteen 110-gallon cartloads of water must be provided every day. The usual procedure is for the water carts and the kitchens to start forward to the front lines from rest areas in the rear as soon as possible after dark. The kitchens remain up front until just before daylight, when they serve breakfast, prepare a packed lunch, and return under cover of darkness. The water carts, in order to deliver the 16 tank loads of water must make four round trips each between dark and daylight. The distance that a mule can travel during the hours of darkness limits the distance from the water points or the number of trips. If four round trips are to be made, and a mule can travel 20 miles between dark and daylight, the water points may be 2½ miles in the rear.

During the World War, mobile water purification units were used. These consisted of a pump, pressure filter and chlorinator mounted on a truck. The pump has a capacity of 100 gallons per minute; the pressure filter, with a diameter of 42 inches, normally is operated at 70 gallons per minute. Provision is made for adding alum and soda ash, but no contact period is provided and no opportunity for sedimentation and coagulation. As a result, turbid waters are not greatly improved, even when the filter is in operation. The entire unit weighs about 17,000 pounds and is difficult to handle off hard-surfaced roads.

(Continued on page 43)

Courtesy The Military Engineer

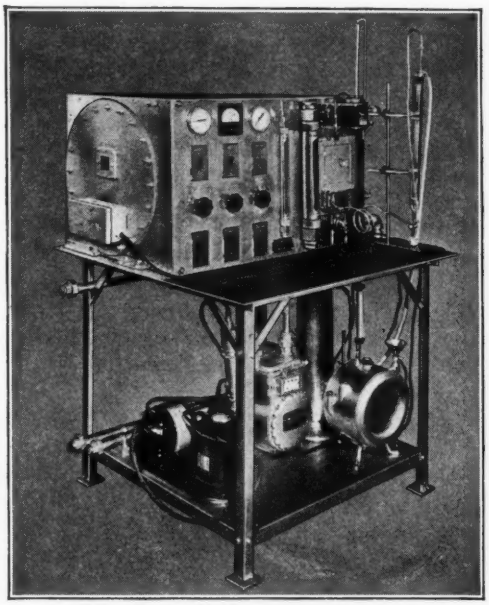
A portable filter in the field.

Ozone HAS DEFINITE Plus Values

A NEW PAGE IN AMERICAN WATER TREATMENT PRACTICE

WHILE ozone is not claimed to be a "cure-all" for all taste and odor problems, its present availability marks a positive advance in the technique of American water purification practice. Its plus values are:—

1. It is a powerful bactericide.
2. If oxidation will remove taste, odor and color, ozone does it better because it is pure nascent oxygen.
3. It introduces no additional chemical into the water.
4. It is simple to control.
5. It "does its stuff" and disappears without leaving the slightest obnoxious trace of its presence.
6. Today's modern equipment plus generally lower electrical energy rates makes it economical to use.



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Ozone Processes, Incorporated, is an operating member of a well-established and soundly financed group, which has been serving American industry for over 60 years. The management is experienced and keenly aware of its responsibility to the Water Works Industry. This explains the thorough research and skilled engineering supporting every move we make in this field.

When you need special information—consult the *classified* READER'S SERVICE DEPT., pages 63-65

Multiple-blade maintainer attached to distributor and followed by motor grader

Surface after aggregate has been mixed. Note bare places where old road was high

Road Mix from Heavy Grade of Cutback Asphalt

By A. H. HINKLE

District Engineer, The Asphalt Institute

MANY miles of Ohio's state roads are suitable in line and grade but need resurfacing and widening of the pavement. One method of doing this on secondary roads is to resurface them with a road mix, correcting the high crown and irregularities in the old surface.

The engineers of the Sidney Division have developed a method of using in the road mix a heavy grade of liquid asphalt designated as MC-5 cutback asphalt, although this grade has been considered by many engineers to be too heavy to use economically in road mix because it becomes too stiff before the completion of the manipulation of the aggregate. However, the use of this heavy grade makes it possible to open the road to traffic more quickly, thus keeping it out of service a comparatively short time and minimizing the annoyance of the splashing of vehicles with the fresh asphalt.

The method originally developed by the engineers of the Sidney Division consists of prompt mixing of the aggregate after the application of the MC-5 by the use of two large motor graders, each making a round and a half on one-half the width of the section of road where loose aggregate had just been treated with asphalt. The round and a half put the machinery always at the forward end of the section so that there was no loss of time in moving empty equipment forward. After the round and a half had been made with the two heavy motor graders a leveling drag was moved forward once on the surface, which was then ready for rolling.

Same as above. Motor grader has Gledhill attachment for mixing and leveling

Recently a contract was awarded for the use of this heavy grade of cutback, calling for 50 pounds of No. 46 (1 inch to No. 4) aggregate with 0.4 gallon of MC-5 in the mix and a seal coat of 0.25 gallon of MC-5 with 20 pounds of No. 6 (½ inch to No. 8) covering aggregate. The highway engineers and the contractor's force together developed a still more economical method of satisfactorily making this mix. A. J. D. Adams multiple-blade maintainer was attached to and pulled by the distributor as it applied the MC-5. Promptly following this was a large Austin-Western motor grader with a Gledhill attachment which further mixed and leveled the aggregate. This double mixing with the maintainer and grader proved very satisfactory and apparently sufficient for this grade of asphalt. While a few of the aggregate particles were not completely coated by the mixing, they soon coated over because of the tendency of the MC grade of asphalt to spread. Slightly less mixing is required with MC cutback than with the RC grade because of this characteristic of the MC material, giving a slightly less cost of making a road mix with the MC material than with RC.

Following this mixing and leveling, the surface was rolled twice with a 10-ton roller. It was then given a seal coat of 0.25 gal. of MC-5 and 20 pounds of aggregate covering. Another rolling completed the operation.

No tack was used on the old surface before the spreading of the aggregate, in order to prevent the development of "fat" spots in the higher places where there was little or no new aggregate. The road being resurfaced by this contractor had a high crown and was quite irregular and the leveling with the new road mix eliminated the high crown and many humps in the old surface by placing the aggregate mixture in the low areas. Had a tack coat been used, the high spots would have had a film of pure asphalt on them not covered by aggregate, and after the seal coat had been applied there would have been a double film of asphalt on these high spots, producing the fat spots

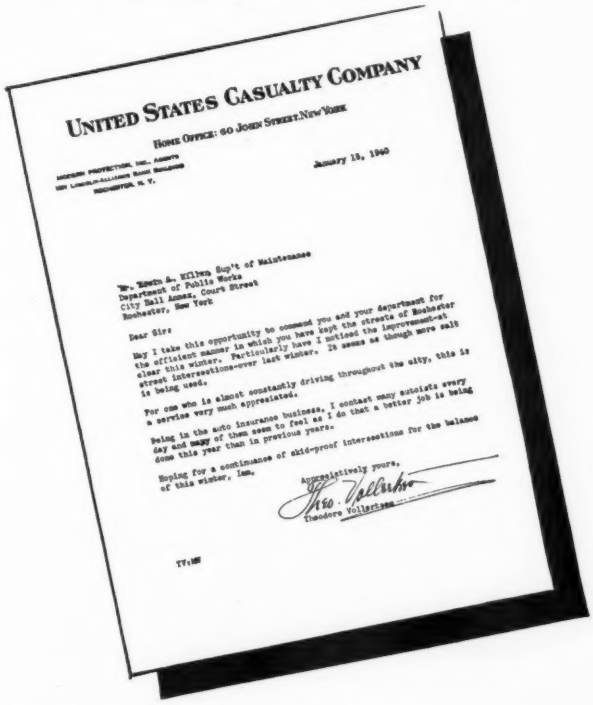
INTERNATIONAL

"Auger Action" ROCK SALT

The public knows and appreciates the safety of streets kept clear—and *safe*—with "Auger Action" *ROCK SALT*

IT IS a matter of public duty for street and road officials to do everything in their power to keep winter streets and roads not only open but safe for traffic. They know when they are doing a good job—but sometimes think that the public takes this hard work and its good results for granted.

What the public thinks! Below is reproduced an unsolicited letter by a citizen of Rochester, N. Y., commending the Department of Public Works for its efficient work in keeping the streets *"clear."* The city of Rochester is one of many progressive cities, municipalities and political divisions of states in the snow belt which use International's "Auger Action" Rock Salt straight, to keep winter traffic moving safely on cleared streets and roads.



UNITED STATES CASUALTY COMPANY

HOME OFFICE: 60 JOHN STREET, NEW YORK

January 13, 1940

Mr. Edwin A. Hilton, Supt of Maintenance
Department of Public Works
City Hall Annex, Court Street
Rochester, New York

Dear Sir:

May I take this opportunity to commend you and your department for the efficient manner in which you have kept the streets of Rochester clear this winter. Particularly have I noticed the improvement at street intersections over last winter. It seems as though more salt is being used.

For one who is almost constantly driving throughout the city, this is a service very much appreciated.

Being in the auto insurance business, I contact many autoists every day and many of them seem to feel as I do that a better job is being done this year than in previous years.

Hoping for a continuance of skid-proof intersections for the balance of this winter, Im,

Appreciatively yours,

Theodore Vollertsen

TV:MF

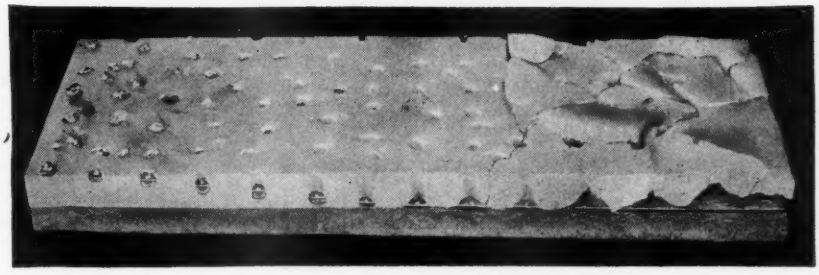
This is not entirely true. The public knows and appreciates the safety of streets made really safe by clearing them of all ice and snow. Occasionally someone takes the time and trouble to express the travelling public's thanks—as in the unsolicited letter reproduced here. The writer says, in part: "It seems as though more salt is being used. For one who is almost constantly driving throughout the city, this is a service very much appreciated. Being in the auto insurance business, I contact many autoists every day and many of them seem to feel as I do, that a better job is being done this year than in previous years."

A better job *is* being done each year, for many cities have now discovered that the most effective way to keep streets clear and really safe is by the proper use of Rock Salt. International's Rock Salt, spread at the beginning of storms, is often enough to remove all snow, and always prevents the snow from packing and bonding to the pavement. If ice has formed, Rock Salt's "Auger Action" bores through and undercuts the ice for quick and easy removal and restoration of utmost safety. For information as to modern methods of using International's Rock Salt for real winter traffic safety, write for a copy of the folder, "Rock Salt's Auger Action."

INTERNATIONAL SALT COMPANY
INCORPORATED
Scranton, Pennsylvania

ROCK SALT'S AUGER ACTION

● This is a photographic reproduction of an accurate model showing Rock Salt's "Auger Action." (1) Spread on hardpacked snow or ice, International's Rock Salt imbeds itself at once, providing immediate "anti-skid" protection. (2) As Rock Salt bores its way downward, brine is formed which undercuts the icy covering and loosens its bond with the pavement surface. (3) Traffic breaks up ice which can be quickly and easily scraped aside to make the pavement completely bare and really safe.



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Meets copper-bearing pure iron requirements in all recognized standard specifications for corrugated metal culverts.

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● Built to withstand the ceaseless pounding of high-speed traffic, GOHI Corrugated Pipe gives outstanding service under modern highways at the lowest per year cost. Economical to install, and free from maintenance expense, GOHI Corrugated Pipe proves its superiority wherever difficult conditions are encountered. Write the fabricator nearest you for complete information.

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DENVER STEEL & IRON WORKS CO. ..... DENVER, COLO.
THE LANE PIPE CORPORATION ..... BATH, N. Y.
DIXIE CULVERT MFG. CO. ..... LITTLE ROCK, ARK.
ST. PAUL CORRUGATING CO. ..... ST. PAUL, MINN.
THE NEWPORT CULVERT CO. ..... NEWPORT, KY.

GOHI CULVERT MANUFACTURERS, INC.,
NEWPORT, KY.

When writing, we will appreciate you mentioning PUBLIC WORKS

which are so often the bane of road mix work. Due to the tendency of the MC product to spread, the old surface became coated with sufficient asphalt to prevent the new mix from pealing off.

Good judgment was shown by the engineers on this project booth in designing a technique for prompt mix of this heavy grade of asphalt and also in omitting the tack coat. This project has fully demonstrated that this heavy grade of asphalt can be used successfully in road mix work, but it is imperative that proper equipment be employed. If suitable equipment is not available, then a lighter grade of asphalt should be used, such as MC-4, or possibly MC-3 in cool weather. If the lighter grades are used, it is more important that some coarse sand or other fine aggregate be incorporated in the mixture.

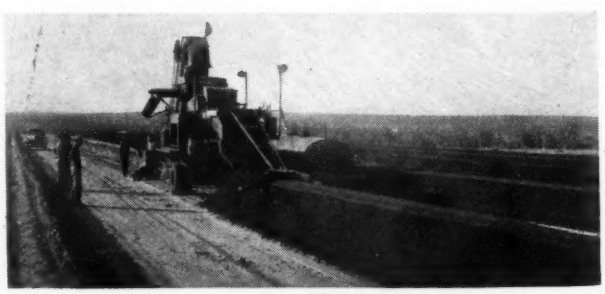
The contractor on this project was the Southern Ohio Quarries Co. The engineers were N. H. Truax, Division Engineer, and R. K. Bowman, Maintenance Engineer, for the Sidney Division of the Ohio State Highway Department.

Recent Airports, High and Low

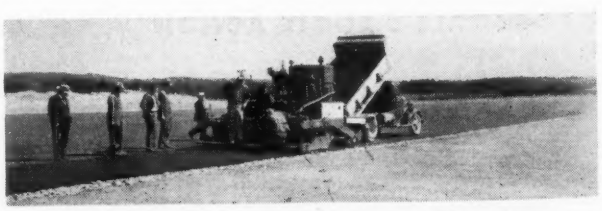
The two photographs shown here illustrate the widely diverse topographical conditions under which our many new airports are being constructed. In the low flat lands at Pensacola nearly a million sq. yd. of mixed-in-place sand-asphalt pavments are being laid at Saufley field. The surface soil is bladed into a windrow and picked up by a traveling plant, which mixes it with the asphalt and discharges it into a windrow behind it, which is afterward spread with blade graders, worked over by them to release the naphtha, and then rolled.

At Morgantown, W. Va., the airport is being built on the top of a mountain, free from all obstructions and fogs, where 300 acres have been leveled off. Here the runways are built with a 12″ base of knapped stone, covered with a 1¼″ binder course of stone and RC3 asphalt, and finally with a 1″ top course of screenings and RC-2 asphalt.

The upper picture shows a Barber-Greene machine conditioning the sand at Pensacola. The lower one shows a Barber-Greene tamping-leveling finisher placing the top course at Morgantown.

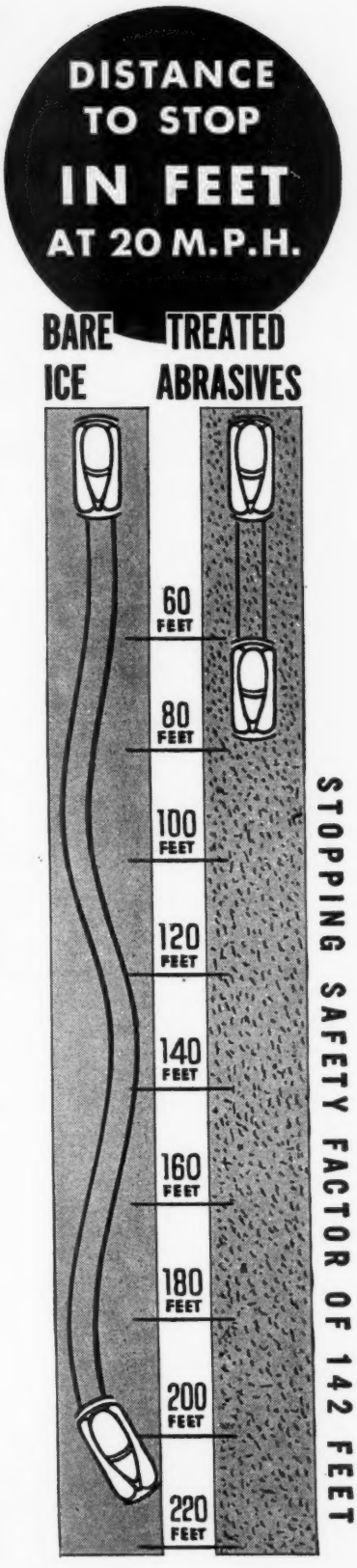


Conditioning and windrowing sand at Pensacola.



Finishing the top course of a runway at Morgantown.

COMBATING THE ICE HAZARD



Treated Abrasives Assure Greater Safety

Actual automobile skid tests made under the supervision of the Committee of Winter Driving Hazards of the National Safety Council last winter, show that treated abrasives spread on snowy and icy roads make driving much safer. Stopping and starting tests proved that ice is at its slipperiest when the air temperature is about at the freezing point. But when the ice was sprinkled over with calcium chloride treated abrasives (sand or cinders), cars traveling 20 miles per hour stopped in one-third the distance or about 140 feet short of the length of skid on bare ice. (See figure at right.) The tests also revealed that treated abrasives gave constant skid resistance regardless of air temperature, while the slipperiness of bare ice varied greatly with the temperature.

Sand and cinders treated with calcium chloride (only 50 pounds* to the cubic yard), when spread on icy roads at ½ to 1 pound to a square yard, are: (1) Most Efficient—Reducing the skidding hazard by two-thirds; (2) Most Economical — Only one-third as much calcium chloride treated abrasives as compared with untreated abrasives give the same anti-skid value; (3) Most Dependable—Calcium chloride gives the only treatment that is freezeproof in sub-zero weather, keeping stockpiles always free-flowing and accessible for instant and effective use.

**Initial treatment with 50 pounds of calcium chloride per cubic yard of abrasive is practically standard in preparation of stockpiles for winter use. From 25 to 50 pounds of calcium chloride are generally added at the time of application, depending upon the degree of cold at the time of spread.*

Write for literature explaining methods of application.

CALCIUM CHLORIDE ASSOCIATION

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FOR BETTER ICE CONTROL

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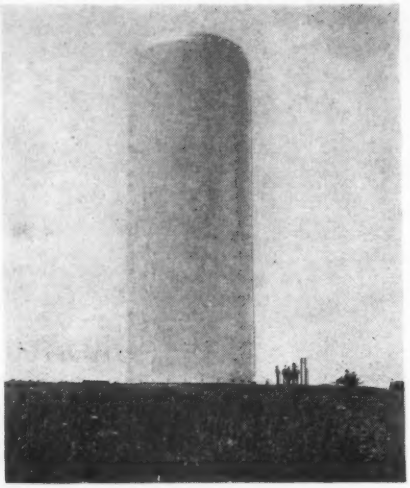


One of two 750,000 gal. all welded steel standpipes

Municipal Improvements in Morganton, North Carolina

By CHESTER F. LEWIS
City Manager

WITH the assistance of Federal funds secured through both the PWA and the WPA Morganton has secured, in the past two years, public improvements worth approximately three-fourths of a million dollars for an actual cash outlay by the city of less than one-half this amount.

These improvements consist of the expansion of the water and sewerage systems to more than double their former size, and a street improvement program which has provided permanent asphalt pavements on a large part of the city's streets.

Water System Improvements

Prior to 1938 Morganton's water system consisted of city-owned watersheds with small intake dams diverting the run-off into a 12-inch cast iron gravity line to the city. A small steel standpipe of 91,400 gallons capacity regulated the pressure and was the only source of supply at the city in case of breakage in the single supply line. The distribution system consisted of a negligible length of 12-inch cast iron pipe and one main line of 8-inch, the other principal lines being of 4-inch and 6-inch pipe. Many small galvanized lines were in use with more consumers connected to them than could be served properly, resulting in many complaints of slow delivery and low pressure.

The city was not only in a dangerous situation so far as fire protection was concerned, but was not able adequately to serve consumers, either old or new.

The improvements made have completely changed conditions. The source of supply has been greatly improved by the purchase of additional watershed at an average cost of $3.75 per acre. The original diversion dam on the main stream has been completely enclosed in a larger concrete dam at the same site to provide, with 2-foot flashboards, a storage of 8,000,000 gallons. No work except to insert a valve was done on the 12-inch gravity supply line. Extreme drouth conditions can now be weathered without curtailment of water use.

Laying 12" super de Lavaud water main

Applying tar primer prior to placing sheet asphalt surface

Within the city there have been built, one at each end of the city, two all-welded steel standpipes 36 feet in diameter and 102 feet high, each containing 750,000 gallons. The overflow level was placed higher than that of the old standpipe, which the new ones displaced, in order to increase pressure where needed.

Where the water pressure formerly would vary during the 24 hours from about 53 to as low as 35 pounds, it now varies only between 67 and 70 pounds, due to the stabilizing effect of the standpipes and the improved distribution system.

The use of all-welded construction in such large standpipes was somewhat unusual but has proved very satisfactory. By welding instead of riveting, the cost of the two standpipes, exclusive of foundations, was reduced from a low bid of $36,575 for two riveted standpipes to a low bid of $28,980 for welded standpipes, a saving of $7,595 or over 20%. The elimination of the noise of riveting was also a very desirable result. On testing, no leaks were discovered, and none have since developed after about one year of service.

The distribution system was greatly improved. A 12-inch connection was made to the gravity supply line and a 12-inch super de Lavaud Class 150 cast iron pipe line laid to the most distant standpipe. A loop of

12-inch pipe also encircles the business area. Secondary distribution lines of 6-inch and 8-inch pipe were laid and connections made to existing lines, not only to improve circulation but to avoid dead-ends. Some 4-inch pipe was removed. A small amount was left in to fill in gaps between larger lines, principally to improve circulation. A total of 120 new fire hydrants were installed and 307 valves in both the old and new lines. Mineralead joint compound was used except in all fittings, valves and hydrant connections and in special locations, where lead was required.

A recent test by the Underwriters' Engineer discloses that fire flow and residual pressures are at all points in excess of their recommended amounts.

Sewerage Improvements

The former system consisted of 6-inch and 8-inch terra cotta pipe lines located in the older and more built-up sections of the city, with no purification of sewage. Various new sections of the city that had built up had been forced to utilize septic tanks and privies, both being unsatisfactory, since the dense clay soil will not absorb the drainage. Complaints were numerous.

The improvements made consisted of the construction of 79,156 feet of vitrified clay sewers, largely 8-inch pipe. G-K, a bituminous jointing compound, was used at a bid price of only one cent per foot more than cement mortar joints would have cost, the greater tightness and resistance to root penetration so obtained being considered to justify the additional cost.

Due to the topography it was not possible to combine the sewer lines into one out-fall, therefore three small Imhoff tanks with sludge beds were constructed. Each tank has a capacity to serve 750 persons with a detention in the flowing-through chamber of 2½ hours and sludge storage equal to 2 cu. ft. per capita. The sludge beds are designed to provide one square foot of drying surface per capita. These three plants complete cost $13,166, or an average of $4,388 each.

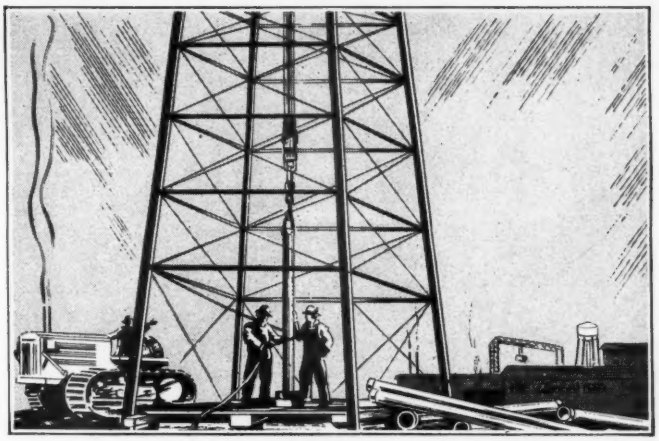
No secondary treatment of the sewage was considered necessary. The small size of plant required, low cost of supervision and lack of mechanical equipment were factors considered in selecting the Imhoff tank.

A very effective fence 6 feet high was built, consisting of 6-inch square posts, spaced not over 8 feet on centers, to which was attached a diamond-mesh fencing surmounted by two strands of barbed wire, and including one walk- and one driveway gate, at a cost per foot of fencing, complete, of $0.50.

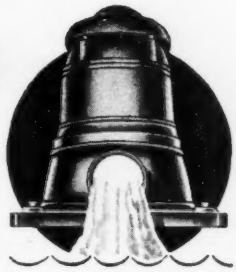
Street Improvements

The street improvements are a combination of work-relief construction projects and PWA project. When Federal funds were first made available the city began the improvement of its streets by grading and draining them, building concrete curbing and surfacing the roadway with crushed rock. In 1938 the first WPA project was begun and completed in January 1940. A second similar project immediately continued the work and is now in progress. These two projects provide for grading and building storm drain lines, the construction of combination concrete curb and gutters, surfacing the roadway with 6 inches of crushed rock produced at the city quarry, and the construction of sidewalks.

Provision was made in the PWA project to provide an asphalt wearing surface for these streets. Specifications for the surfacing were drawn to permit bids on both the cold-lay and the hot types of asphaltic con-



DON'T LET WATER SHORTAGE "BOTTLE NECK" YOUR PRODUCTION



If you are in need of more water for increasing production, consider the immediate installation of new Wells and Pumps. Such a move may prove necessary at an early date and very likely it will be one of splendid economy. Municipal water plants may not be able to continue favorable rates, nor may they be able to care for greatly increased water supplies to factories.

Of course, you will consider Layne Wells and Pumps above all others, for they are proven in efficiency, long life, low operation cost and dependability. In addition, Layne offers a nation wide organization adequate in size and equipment to always provide service when and as needed. Excellent manufacturing facilities keep step with pump and well supply needs.

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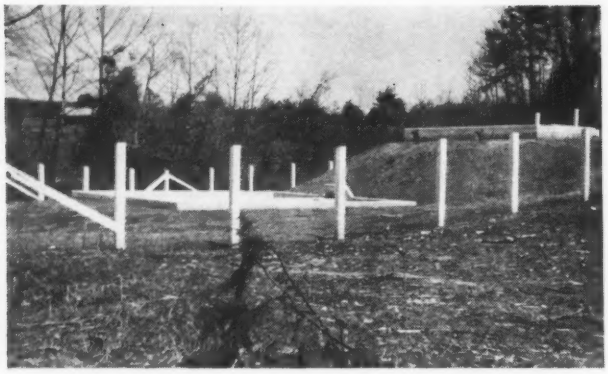


Sewage treatment plant. Imhoff tank in background; sludge bed in foreground.

cretes. The low bid was on standard sheet asphalt binder and wearing surface so this type was used.

The specifications provided for the preparation of the roadway to be done by the city, after which the contractor applied a prime coat of 0.4 gallon of tar per square yard. When this surface was in proper condition to receive it, there was placed a course of sheet asphalt binder upon which, after being rolled, a similar course of sheet asphalt wearing surface was placed. On those streets subject to heaviest traffic, each course was made about one inch thick, giving a finished pavement thickness of two inches. These thicknesses were reduced on lighter-traffic streets to about ¾ inch each, or 1½ inches total. A very satisfactory pavement resulted which held up without a single failure through an unusually severe winter.

An asphalt spreader machine was used throughout and greatly speeded up construction as well as producing an excellent surface with a minimum of hand raking.

The prime application, binder and wearing surface cost $0.70 per square yard for two-inch thickness and $0.53 per square yard for one and one-half inch thickness, based on the material weighing 100 pounds per square yard per inch of thickness.

In the present WPA project, new streets are being constructed in the same manner as the previously constructed streets but it is expected that considerations of economy, the small amount of work to be done, and the desire to surface the streets as the work progresses, will result in the surface-treating of the streets rather than using a plant-mix.

Quarry Operations

The quarry, which is operated with WPA labor, produces all stone used in stone masonry work, concrete work and roadway surfacing. The arrangement is probably quite like many others, but the method of conveying the rock from the quarry to the crusher merits description. Originally, the rock was removed in wheelbarrows, which was a costly, slow and laborious method. To increase capacity, a dump truck was placed in the quarry pit and wheelbarrows eliminated. At times two such trucks were necessary, each requiring loading crews. These have now been removed and a truck chassis with a hoist at the rear is used. Six one-cubic yard capacity buckets, or skips, are placed around the quarry and as they are filled by the rock breakers they are picked up by the hoist and carried to the crusher. Fewer laborers are required, less equipment is used and the output has been increased.

Unit Costs

Unit prices bid on the main items involved in the contracts were as follows, all work complete in place.

Water System

Cast iron pipe, 30″ cover, per lineal foot: 2″, $0.43; 6″, $1.02; 8″, $1.43; 12″, $2.28. Special, 6 cts. a pound. Gate valves and boxes: 2″, $12; 6″, $25; 8″, $40; 12″, $75. Hydrants, $55. Concrete in standpipe foundation, 1:1½:3 mix, $17.

Vitrified Clay Sewers

6″ house sewers, 0 to 4 ft. deep, per foot, $0.46. 8″ mains, 0 to 4 ft. deep, $0.57. 8″ mains at greater depths, by 2-ft. intervals (4-6, 6-8, etc.), $0.59, $0.69, $0.95, $1.23, $1.55, $2.04, $2.87 $4.26, $6.26, $8.26 (22 to 24 ft. deep). Manholes, 4 ft. diameter, up to 6 ft. deep, $42; 6 to 12 ft., $6.50 per foot of extra depth; 12 to 20 ft., $15 per foot of extra depth. Rock excavation, $4 per cu. yd.

Contractors. Seven construction contracts were awarded on this PWA work as follows:

Contract 1—Street Improvements—Blythe Bros. Co., Charlotte, N. C.

Contract 2—Water and Sewage Improvements, Reed & Abee, Inc., Asheville, N. C.

Contract 3—Steel Standpipes, The Steel Construction Co., Birmingham, Ala.

Contract 4—Street Improvement, Blythe Bros. Co.

Contract 5—Street Improvement, Reed & Abee Inc.

Contract 8—Sewage Disposal Plants, Reed & Abee Inc.

Contract 9—Water Supply Dam, W. F. Brinkley, Granite Quarry, N. C.

Engineering. All surveys, plans and specifications were made by the City Engineering office under the personal supervision and direction of the writer assisted by R. C. Wallace, Resident Engineer and Gorman Orders, Inspector. Others were also engaged during different stages of the work. Approximately $14,000 was saved in the engineering cost alone.

Water Supply and Sewage Disposal for Airports

(Continued from page 26)

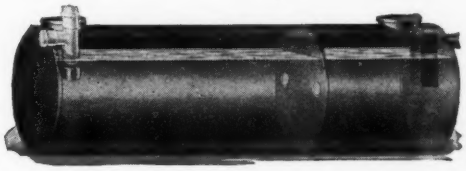
unpredictable, of such a nature that they cannot be enlarged but must be abandoned when overloaded, is poor engineering.

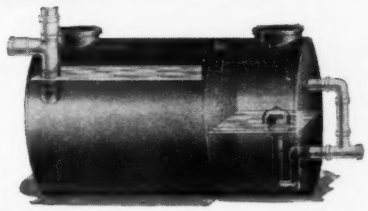
Such provision for enlargement can best be made, as a rule, by arranging the inlet device to permit construction of additional septic or settling tanks; and to provide filters or other secondary treatment devices that can also be easily duplicated.

Sufficient treatment to prevent danger to health, nuisance or odor should always be provided. An airport costs many thousand dollars. Adequate sewage treatment is a health and esthetic necessity, and is a basic item of construction that is as important as runways or hangers. Provision for it should not be an afterthought.

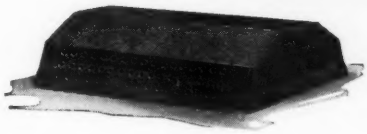
For the small airport, a septic tank with subsurface disposal, either by leaching cesspools or tile lines, is economical and satisfactory for flows up to 10,000 gallons per day, or even more where the soil is very porous. Metal septic tanks are especially suited to quick and easy installation, but built-in-place tanks, if properly designed and constructed, are also satisfactory. For flows in excess of 10,000 gallons per day, a trickling or sand filter is better for final disposal. State Board of Health requirements should govern the size of the septic tank. In general, provision should

be made for a detention period of 8 to 10 hours with the design flow.





Metal "San - Equip septic tanks suitable for small and medium size airports.



Drain pool, a substitute for tile drainage where area is limited.

For flows in excess of 20,000 gallons per day, and up to 50,000 gallons, an Imhoff tank is desirable. But this may involve such deep excavation, under some conditions, as to make sedimentation and separate sludge digestion preferable.

For secondary treatment, the standard trickling filter with rotary distributor is well adapted to airport sewage treatment. Standard design procedures as approved by the State Board of Health should be followed. High-capacity filters are especially adapted to such installations, however, because recirculation can be employed during periods of low flow to maintain proper operation.

Points to be given special consideration in the design of sewage disposal facilities for airports include: Provision to handle properly the highly variable flows that will be encountered; design for treatment that will not cause danger to health, nuisance or odor, either in operation or as a result of the discharge of the effluent; and full provision for future enlargement as needed, including plant layout details and area required for expansion.

Surfacing Runways at Southern Airports

A large part of the New Orleans airport was fill pumped from Lake Ponchartrain and sand pumped from this lake was used for the sheet asphalt pavement laid on the runways. This was made 4″ thick, laid in two courses. In order to produce a long-lived mixture, an emulsified oil was used in that laid on runways, driveways, aprons and taxiways. However, it was found to be too soft to support standing loads, and on the taxiways, aprons and driveways from ¾″ to

Municipal airport, Columbia, S. C.

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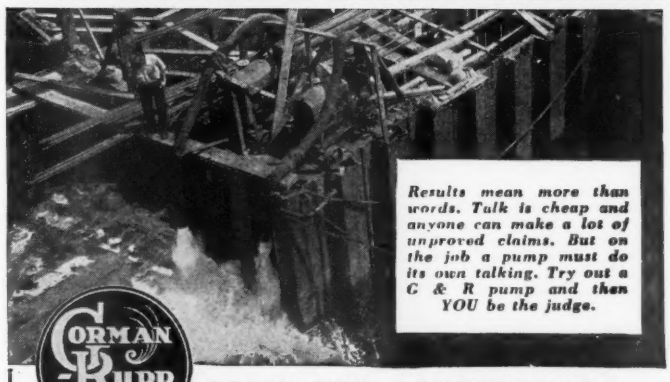

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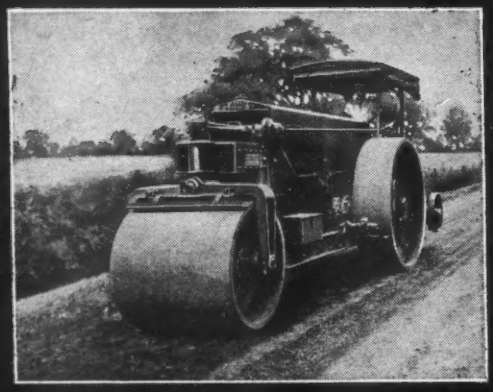
1″ of hot mix asphaltic limestone was laid on the sheet asphalt as a surface course.

In the airport at Meridian, Miss., a deposit of sand and clay located within half a mile of the airport was used 12″ thick as a stabilized subbase for the runways. On this was laid a 4″ base of waterbound slag bonded with a small amount of clay. This was then primed and covered with a 1″ compacted surface course of hot mix Alabama asphaltic limestone. Only one runway was built at first but plans for lengthening this and building two additional ones have been approved.

New Orleans Airport

Further north, at Columbia, S. C., another type of paving was used in paving 110,000 sq. yds. of runway in 1937, and extensions are now being laid with the same material. This is a tar-primed sand-clay base, 1½ inches of "Colprovia" binder and ½ inch of "Colprovia" sheet top. Director of the Aeronautics Commission Dexter C. Martin states that he finds it especially free from a tendency to skidding.

In Jacksonville, Fla., the runways are being paved with limerock, surface-treated with asphalt oil. Limerock is practically the only rock found in Florida, and the State highway department has found this type of pavement to be serviceable and economical. Another reason for its use is that, owing to the speed with which this field had to be graded, there may be some settlement in the future, and this type of surfacing has a high salvage value for resurfacing.



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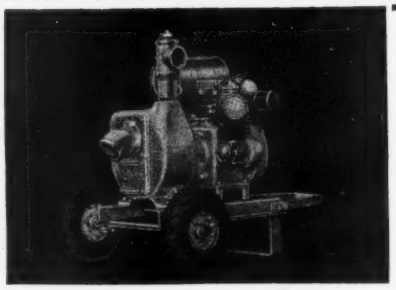

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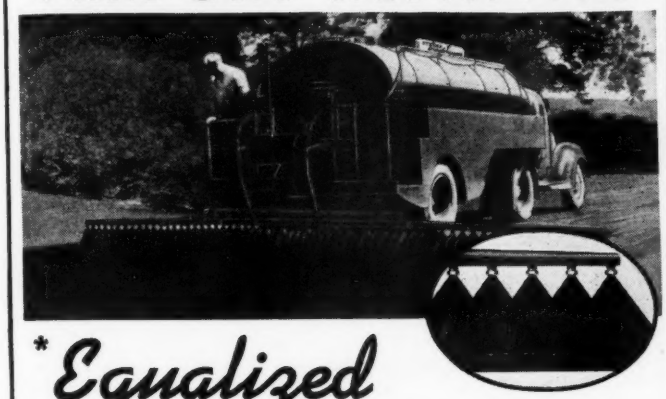

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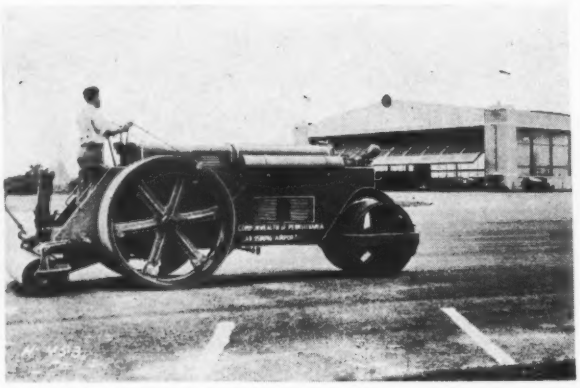

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Federal-Aid Funds for Highways for 1942 and 1943

The Federal Highway Act of 1940, which authorizes regular Federal-aid funds for highways, secondary or feeder roads, and grade crossings for the fiscal years 1942 and 1943, was approved on September 5, 1940. The act is in conformity with the congressional policy of authorizing, in advance of the period for which they are available, the Federal-aid funds for 2 years, enabling the various State legislatures, many of which meet biennially, to plan their highway budgets with foreknowledge of their approximate Federal-aid apportionments. Federal funds for other classes of road work are also provided by the act, the amounts provided for each fiscal year being as follows:

Item	*Amount for each fiscal year*
Federal-aid system	$100,000,000
Secondary or feeder roads	17,500,000
Elimination of hazards at grade crossings	20,000,000
National forest highways	7,000,000
National forest development roads	3,000,000
National park roads	4,000,000
Parkways	7,500,000
Public land roads	1,500,000
Indian roads	3,000,000

As in previous years, the Federal-aid Highway and secondary road funds must be matched with State funds, and the grade crossing funds are outright grants to the States. Funds for these three classes of work for the fiscal year 1942 are required by law to be apportioned to the States, the District of Columbia, Hawaii, and Puerto Rico, by the Federal Works Administrator before next January 1. Formulas for apportioning the funds among the States remain unchanged.

Section 12 of the act specifically authorizes the Reconstruction Finance Corporation "to cooperate with States to finance, or to aid in financing, the acquisition of real property or interests in property * * * necessary or desirable for road projects eligible for Federal aid under the Federal Highway Act * * * *." This provision will enable the long-term financing of highway rights-of-way through cities, thereby facilitating the early completion of necessary improvements that heretofore have not been undertaken because of the lack of sufficient current funds to pay both right-of-way and construction costs. High right-of-way costs, in many cases amounting to several times the actual construction costs, have retarded improvements to main routes through cities needed to eliminate traffic congestion and attendant danger and delay.

Section 19 of the act provides that: "In approving Federal-aid highway projects to be carried out with any unobligated funds apportioned to any State, the Commissioner of Public Roads may give priority of approval to, and expedite the construction of, projects that are recommended by the appropriate Federal defense agency as important to the national defense."

Under this provision of the law it should be possible to make an immediate beginning on the strategic highway program. A system of 75,000 miles of main highways has been selected by military and naval authorities as highly important for definite strategic reasons. Many sections of the system are already in satisfactory condition but there are also numerous substandard sections. Replacing weak bridges and widening and strengthening road surfaces and shoulders will be important parts of the work. The program is aimed at the elimination of critical weaknesses and restrictions on main highways.

Water Supply for the Army

(Continued from page 30)

Within the past two years there has been developed a portable filter which weighs about 700 pounds. When operated as a filter it has a capacity of 12 to 15 gpm., and somewhat more when not filtering. This unit is carried on a truck or trailer.

Recently a smaller unit has been developed, but is not being used for army water supply. This is a pack filter, which is designed to be carried on a man's back. It weighs 34 pounds and has a capacity, with a hand-operated pump, of about 2 gpm. Paper pads are used for the filtering medium, though other materials can be employed. Using the standard paper pads, excellent results are obtained, practically crystal clear water being normally produced even from turbid supplies; but preliminary clarification greatly prolongs the useful life of the filter media. No chemicals are used; but the filtered water is always chlorinated, as is the universal practice in army water supply.

The portable filters were used in the 1940 maneuvers and proved very satisfactory. These are provided with hypochlorinators for final treatment of the water.

The mobile purification unit is of especial value when in stabilized positions. Normally one unit is assigned to each division, this being set up in the rear and the water hauled in 500-gallon tanks to the water distributing points. Present practice with the portable filter is to assign one to each combat team.

Within the past two years, mechanization and greater mobility have been stressed, with the result that troops are now spread out over wider areas. This complicates the problem of water haulage and the use of the smaller portable units, which can accompany the troops, has many advantages. Also, because there are fewer troops per unit of area, local supplies can more often supply the demand for water. With large numbers of soldiers, wells, springs, cisterns and small streams are inadequate, but when the dispersion of troops is great, these supplies may be ample. Generally such small supplies are of better quality than water from large streams and less treatment is required.

In arid or desert regions, where local supplies of any kind are absent, water must be hauled to the troops. This may be done by railroad tank cars or by tank trucks, but in either case long-distance transportation of water involves considerable difficulty.

Metallic Hardeners for Concrete Runways

Concrete is being used extensively for hangar aprons and hangar floors as well as airport runways, and engineers, in an effort to make these dustproof and more durable, are giving increasing consideration to metallic surface hardeners, which have for some time been used in industrial plants. The basic ingredient of these hardeners is a specially prepared chemical iron which forms a water-absorbent metallic aggregate. Mixture with water causes the iron in the aggregate to oxidize, the resultant expansion filling up the pores of the concrete and providing an iron-bound surface which is said to improve with use. Abrasion tests made at experiment stations of several colleges seem to show that concrete surfaces hardened with this water-absorbent metallic material average over two and a half times as resistant to heavy wear as the ordinary unhardened concrete surface.

This treatment is ordinarily applied in the original construction but it is possible to treat existing concrete surfaces with a topping of metallic hardener.

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Airport Drainage and Subdrainage

(Continued from page 13)

will be effective only in the most open types of soils; in most cases a series of laterals must extend under the runway, preferably draining to a pipe parallel to the runway edge. Especial care should be taken in design, selection of materials and construction of such drains, since their failure involves costly and difficult replacement.

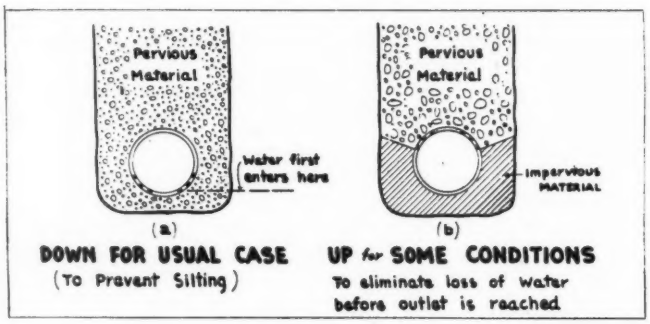
Subdrains are normally composed of special drain pipe with adequate openings to permit entrance of the water, the pipe being laid in a trench 12 to 18 inches wide, and backfilled with broken stone, gravel or other pervious material. Some typical methods of construction are shown herewith.

Surface Drainage

The volume of storm water runoff is computed as for storm sewers. Rainfall intensity data will determine the factors to be obtained. However, it is not generally desirable to design a system able to remove the heaviest expected rainfall almost as it falls. Armco recommends "that the intensity of the hourly rainfall that will not be exceeded more than one a year" be determined and the surface drainage system be designed to remove this within 2 hours after the rainfall ceases. Armco further recommends a rainfall rate of 1.8 inches per hour for the Gulf States, about 1.4 inches per hour for other Southeastern states and around 1 inch per hour for the remainder of the states east of the Rockies, and states that "this range of values has been used on numerous airports during the past 14 years and has been found satisfactory."

From these data, the required capacity of the storm drains are easily computed, due allowance being made for the size, shape and slopes of the area, and the character and condition of the soil. Runoff from runways will range from 85% to 100%; for areas other than paved and roof surfaces, a runoff of 10% to 25% may be used.

Runways are crowned to drain storm water to the edges, where intercepting lines collect it and discharge it into the outlet system. Those positions of the field other than runways should be so sloped as to facilitate collection of the storm water. Intercepting drains of various types have been developed. Two types are shown herewith; these should be placed across the flow of surface water.



Armco drain pipe is placed sometimes with openings in the bottom, sometimes in the top.

For Highway and Airport Drainage

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VITRIFIED PIPE of outstanding quality and low absorption — extraordinary crushing strength — with full strength in the joints — and perforated for faster, more efficient drainage. Not a makeshift, not an "adaptation." *Built exclusively for drainage service!* Low in first cost—easy to lay—built to last. No wonder Bosco Perforated Plain-End Pipe and Tru-Line Collars are getting the call for Highway and Airport drainage! Greater flexibility. Better alignment. Fully protected joints. No "weak spots" anywhere. Ideal for septic tank drainage. Full information on request.

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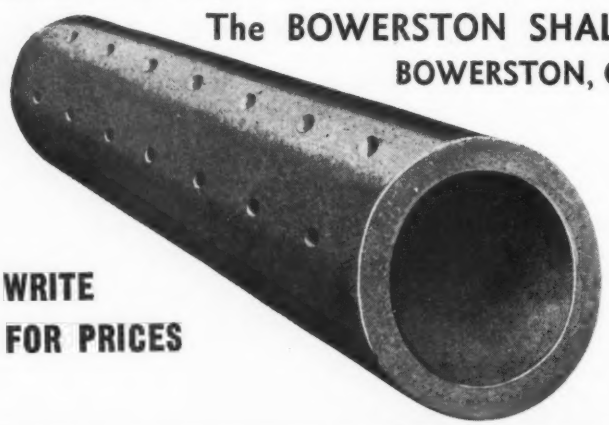

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The depth of the pipes of the storm drainage system will depend upon hydraulic factors, as in any storm drain system; and it may also be influenced by pipe loads. The minimum cover used should provide protection against crushing by wheel loads caused by planes or trucks.

Combined Drainage System

It is possible to use the same discharge system for both surface and subsurface drains. According to Armco's Manual, experience shows that a surface drainage system is running at a maximum in less than 45 minutes after the beginning of a rain, and the system should be designed to remove such water within two hours after the rainfall stops. On the other hand, maximum discharge from a subsurface drainage system generally occurs 4 to 6 hours after a heavy rain of short duration. Care should be taken in design to provide that subsurface drains are not flooded when the outlet system is running full.

Airport Drainage Coefficients

(From Armco "Manual of Airport Drainage")

Required Capacity of a Drain in Cubic Feet Per Second to Remove Various Depths of Water in 24 Hours (Elliott)

Depth in Inches		*Capacity, Cu. Ft. per Sec.*	
Fraction	*Decimal*	*Per Acre*	*Per Sq. Mile*
1	1.000	.0420	26.88
15/16	.938	.0394	25.20
7/8	.875	.0367	23.52
13/16	.812	.0341	21.84
3/4	.750	.0315	20.16
11/16	.688	.0289	18.48
5/8	.625	.0262	16.80
9/16	.562	.0236	15.12
1/2	.500	.0210	13.44
7/16	.438	.0184	11.76
3/8	.375	.0157	10.08
5/16	.312	.0131	8.40
1/4	.250	.0105	6.72
3/16	.188	.0079	5.04
1/8	.125	.0052	3.36
1/16	.062	.0026	1.68

Acknowledgments

Free use has been made in the preparation of this article of the "Manual of Airport Drainage," prepared by Armco Drainage Products Association, and data have been taken from the catalog of Gohi Culvert Mfrs. Assn. and from "Subdrainage" issued by Toncan Culvert Mfrs. Assn.

Recommended Depth and Spacings of Subdrains

(From Armco "Manual of Airport Drainage")

Soil Classes	*Percentage of Soil Separates*			*Depth of Bottom of Drain in Feet*	*Distance Between Subdrains in Feet*
	Sand	*Silt*	*Clay*		
Sand	80–100	0–20	0–20	3–4	150–300
				2–3	100–150
Sandy Loam	50–80	0–50	0–20	3–4	100–150
				2–3	85–100
Loam	30–50	30–50	0–20	3–4	85-100
				2–3	75–85
Silt Loam ..	0–50	50–100	0–20	3–4	75–85
				2–3	65–75
Sandy Clay Loam	50–80	0–30	20–30	3–4	65–75
				2–3	55–65
Clay Loam .	20–50	20–50	20–30	3–4	55–65
				2–3	45–55
Silty Clay Loam ...	0–30	50–80	20–30	3–4	45–55
				2–3	40–45
Sandy Clay.	50–70	0–20	30–50	3–4	40–45
				2–3	35–40
Silty Clay..	0–20	50–70	30–50	3–4	35–40
				2–3	30–35
Clay	0–50	0–50	30–100	3–4	30–35
				2–3	25-30

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The High Speed Drainage Material for AIRPORTS

GLAZED CLAY SEWER PIPE

GLAZED CLAY FILTER BED BLOCKS

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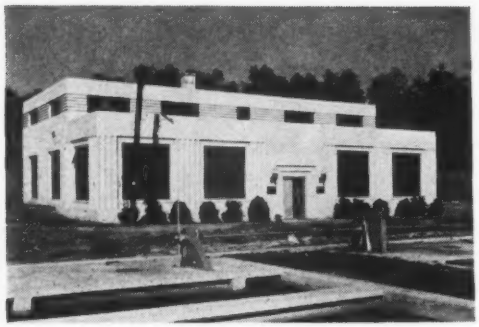

Atlanta, Ga., Sewage Treatment Plant

The Sewerage Digest

A Digest of the Sewerage Literature of the Month giving the main features of all the important articles published.

HOW TO FIND ORIGINAL ARTICLES. Key letter at end of each digest refers to name of publication listed in bibliography at end of this section. Numeral indicates title of article.

Relining An Old Sewer

Decatur, Ill., last year relined 2.8 miles of 20-yr. old concrete pipe of 60", 54" and 48" diameter by shotcreting the surface with a minimum thickness of 2" of concrete. The original walls had been 4" to 6" thick and the lower third had been considerably eroded and much of the invert entirely destroyed. Loose concrete was removed with hand picks and sand-blasted and cleaned with water and air blast just before concreting. For reinforcing, road mesh fabric of 10-gauge wires was tied to longitudinal rods 30" or less apart, supported by lag bolts set into the sewer wall on 6 ft. centers. The shotcrete was a 1:3 or 1:3.5 mixture of portland cement and No. 1 and No. 2 torpedo sand. Cost, slightly over 30 cents a sq. ft. During operation, sewage was carried through the sewer in an 18" corrugated pipe in sections about 200 ft. long. In a day of two 8 hr. shifts about 1,000 sq. ft. was lined.[E 29]

Vacuum Filtration At Richmond-Sunset Plant

At the Richmond-Sunset (San Francisco) plant, digested sludge is dewatered on vacuum filters, preceded by elutriation using treated effluent for wash water, which is then recirculated through the works. Short circuiting in the elutriation tanks made the wash water high in suspended solids and its return to the sedimentation tanks caused trouble, which was overcome by construction of baffles in the elutriation tanks. At present 4% ferric chloride is added to sludge of 96% moisture content, and the filter rate averages 6 to 6½ lb. of dry solids per sq. ft. per hr.; but chemical dose can be reduced by shortening the mixing time and discharging the mixed sludge directly to the filter vat. Wool cloths have been found to have much longer life than cotton.[L 8]

Uses of Sludge Gas

Fort Dodge, Ia., sewage is about 35% to 45% pork packing wastes, total about 2 mgd. Gas production averaged 108,000 cu. ft. per day—over 2½ cu. ft. per capita or 1½ per equivalent population. Of 39.4 million cu. ft. produced during the year, 27.2 was utilized to generate 1,123,400 kwh of electricity; of which 400,900 kwh was used in operation of the plant and 722,500 was sold to the local utility company under a 25-yr. contract to purchase all surplus current at 0.85 ct. per kwh. The city contemplates installing an additional generating unit. The revenue derived from gas-generated power last year was $9,416 or 42% of the cost of operation and maintenance.[H 43]

At Davenport, Ia., temporary excess of gas is pumped into a 58,000 cu. ft. spherical gas holder up to 50 lb. pressure. When this pressure is reached, any further excess gas is burned in a waste gas burner. Gas produced averages 65,000 cu. ft. per day, of which 35,000 is used in gas engines for driving a pump and generator, and heating the digesters through a heat exchanger.[H 48]

Sludge at Ypsilanti, Mich.

For five months lime sludge from Ypsilanti's new water softening plant was run into the sewage plant. There was little effect on the final effluent; the digestion tanks filled quickly but digestion was not retarded; the sludge drawn was so thick that is was very difficult to handle with pumps and would scarcely flow on the drying beds.

One of the two clarifiers contains a flocculator, and in 1939, when both were receiving practically the same amount of sewage with the same detention period, the removal of suspended solids was 54% in the plain clarifier and 65% in the flocculator-clarifier.[H 49]

Barrie, Ont., Interceptor and Outfall

The recently completed interceptor 6,000 ft. long was laid of asbestos-bonded asphalt-coated corrugated iron pipe with an asphalt paved invert. It was designed to provide a cleansing velocity of 3 to 4 fps (15" at .0022 grade, 18" at .0017 and 24" at .0012). The velocity has been well above that anticipated and an investigation is to be made to determine the Kutter's *n*. "It is believed that the use of this pipe will make possible the designing of sewers with flatter grades." Much of the interceptor is through marsh giving neither vertical nor lateral support and is supported on piles at 10 ft. intervals. With 14 ft. of sand backfill, there is no deflection from line or grade. The horizontal diameter increased ⅜" under a top test load of 16,000 lb. The outfall 470 ft. long was of 30" pipe of the same type, connected together on top of the ice and lowered through a channel cut in it to an outlet depth of 18 ft.[M 7]

Complete Sewer Maintenance Truck

The New Jersey "Joint Meeting" sewer commission has built a maintenance truck for use on its 56 miles of main sewer, of all-steel water tight construction on a 1½-2 ton Ford chassis, carrying all necessary tools and equipment in side compartments accessible from outside, leaving the inside of the body free to carry any material (sand, stone, etc.). More than a dozen compartments are built into the sides, carrying hose mask and blower, oxygen inhalator, hydrogen sulfide detector, oxygen deficiency lamp, carbon monoxide detector, combustible gas indicator, chipping goggles, first aid kit; shovels, crow bars, sledge hammers, mauls, bull points and other compressor tools; eight 16 qt. pails; collapsible safety signs; masonry tools; manhole hooks, rubber gloves, telephones; nails and screws; sewer rods, brooms, shovels, axes; hoze nozzles, hydrant adaptors, hydrant wrenches, siamese connections, self-propelling ferret, revolving nozzles, joint runners, wrenches, etc.; electric drill, "flexible" sewer cleaning equipment; rubber boots, coats and hats; ropes, safety belts, electric extension cords; wooden skids. The rear third of the roof can be slid forward, permitting carrying tall objects. The inside of the body can be divided into three compartments for carrying sand and stone, etc. Short wave radio will be installed.[G 31]

Enzymes In Activated Sludge

Oxidation-reduction enzymes are essential in activated sludge production and in the purification of sewage by this process. There is a direct relation between the concentration and the rate of activity of enzymes, so that the activity of activated sludge is dependent upon the concentration of these enzymes; which rate is affected also by the temperature, the amount of oxygen supplied, the pH of the medium and the type of food. The type of activity of activated sludge is determined by the groups of oxidation-reduction enzymes developed, which is

A SPADE is one of the oldest tools known to man and still very handy when it comes to leveling off the bottom of a trench. But trench hoes and bulldozers have largely displaced the spade in the construction of cast iron pipe lines. Cast iron pipe is likewise one of the oldest materials for underground mains. Yet, in three centuries, no other type of pipe has usurped its place as the *standard* material for underground mains. Super-de Lavaud *chill-free* centrifugally cast iron pipe is the same standard material produced by improved and carefully controlled casting methods.

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determined by the types of food, amount of oxygen supplied and the temperature. The concentration of the oxidation-reduction enzymes for a particular food is dependent upon the nature of the food and the previous contact of the sludge with that food, and is greater in activated sludge than in sewage. There still remains unanswered the question why some organisms grow more readily as the oxygen concentration decreases while others function better at higher oxygen concentration.[C 74]

Plant Operation At Buffalo, New York

Buffalo's new treatment plant went into operation July 1, 1938. In addition to the difficulties ordinarily experienced in breaking in a new plant, this one had to handle sewage containing large amounts of solids which were flushed out of the sewers, which had not been cleaned for many years. Up to May 31 of this year, 665,000 ft. of sewers had been cleaned, one 8′ sewer being nearly full at one point. Although cleaned by use of bucket and dragline, much silt was washed down to the plant along with numerous other objects, such as stones, bricks, a 10′ ladder, pieces of lumber, etc. This so clogged the trash racks as to cause them to buckle. In summer and autumn the racks collected frogs and fish, some over one pound in weight. Most trouble, however, is given by material from the grit channels, which averages about 12,000 pounds a day of dry solids, so much of which is fine sand that the sewage cake from the vacuum filters contains from 28% to 39% of sand. The grit is burned in an incinerator mixed with sludge and it has been found possible to burn it alone several hours, while equal parts of grit and sludge burn readily.

The vacuum filters have proved capable of dewatering twice the specified rate, reaching a maximum of 13.4 pounds per sq. ft. per hour. Filter cloths of woolen, canvas duck, burlap and cotton flannel have been tried on the filters and the teasel of the last appears to make it the most satisfactory. The wire around the drum is spaced at 1½″ instead of 3″, which appears to increase the life of the cloth, which is now 200 to 225 hours. The cloth rests on a monel metal screen and this, after a year of operation, was covered with an incrustation of calcium carbonate which could not be removed mechanically, but the screen was restored to its original condition by bathing for 10 hours in a 5% to 10% solution of muriatic acid.[C 78]

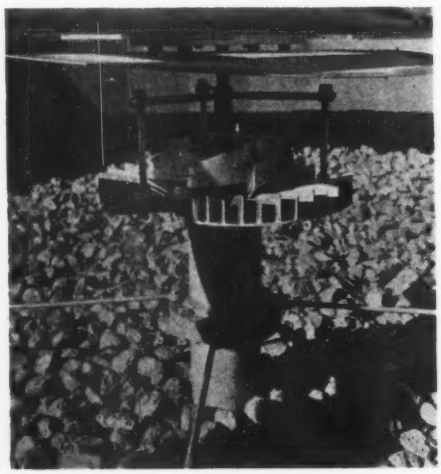
Incinerating Vacuum Filter Cakes

Filter cakes from vacuum filtration are incinerated in multiple-hearth furnaces in Auburn, Elmira and Greece, N. Y., and these seem to give good results in all three except for difficulty in removing ash. In Auburn ash is discharged from the bottom hearth into a steel box holding about 500 lbs., from which it is removed by an enclosed air system under a 6″ vacuum and discharged into a 10-ton elevated tank outside the building and removed by truck at intervals. To prevent the ash-laden air from clogging the blower, an air washer is used which has to be cleaned daily. Moisture frequently enters the ash pipes and causes them to clog with ashes, when they must be taken apart and cleaned. They hope to find a better method of handling the ashes. Greece finds the only incinerator difficulties are caused by the ash elevator and the spiral conveyor. The ashes have worn the sprockets of these so badly that they have had to be replaced twice. It has been difficult to make the elevator casing dust-tight.[C 79]

Pollution Control in California

In controlling pollution of streams, California employs enforcement of Federal and State laws, and injunction or private damage suits. Under Federal law it is illegal to discharge oil from vessels into the navigable waters or refuse from vessels or shore plants except from sewers. The State Fish and Game and Public Health laws restrict pollution deleterious to fish, plant life or bird life and to conditions which are a nuisance or a menace to health; but neither act includes damage to agricultural, industrial or recreational uses, for which injunction proceedings or damage suits are the only remedy.[C 81]

AERO-FILTERS



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Animal Health Not Affected by Sewage

Four cows and 18 swine, all in good health, were fed sewage, treatment plant effluent and sludge from an animal disease station at Beltsville, Md., to determine whether they could contract tuberculosis or brucellosis. After a six-month test, believed to be a more sever exposure to effluent than would ordinarily occur to livestock below a modern-type sewage treatment plant, the investigators concluded that "virulent bacteria are not present in sufficient concentration in the incoming sewage, effluent and sludge of this sewage treatment plant to cause disease in susceptible animals."[L5]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

C *Sewage Works Journal*
September

73. t. Bulking of Sludge Fed With Pure Substances and Supplied With Different Amounts of Oxygen. By R. S. Ingols and H. Heukelekian. Pp. 849-861.
74. t. Oxidation Reduction Enzymes in Activated Sludge. By R. S. Ingols. Pp. 862-874.
75. A New Yardstick for Measuring Sewage Pollution. By W. L. Mallmann. Pp. 875-878.
76. The Sewage Situation of the City of Los Angeles. By F. Thomas. Pp. 879-894.
77. The Covina, Calif., Sewage Treatment Plant. By A. H. Koebig, Jr. Pp. 895-906.
78. Operating Experiences in Sewage Treatment at Buffalo, N. Y. By C. R. Velzy, J. W. Johnson and G. E. Symons. Pp. 907-918.
79. Sludge Filtration and Incineration at Auburn, N. Y. By J. T. Lynch and H. E. Milliken. At Elmira, N. Y. By G. J. McInerny. At Greece, N. Y. By W. D. Denise. Pp. 919-938.
80. Sewerage in Ancient and Mediaeval Times. By H. F. Gray. Pp. 939-946.
81. Pollution Control Work of the California State Division of Fish and Game. By P. A. Shaw. Pp. 947-953.
82. Allocation of Responsibility for Bacterial Pollution in a Stream. By L. F. Oeming. Pp. 954-956.
83. Treatment of Sewage and Textile Wastes by Recirculation Filtration. By R. Porges, H. J. Miles and H. G. Baity. Pp. 957-968.
84. Methods and Problems of Sewer Maintenance. By R. F. Brown. Pp. 969-977.
85. Sewer Maintenance. By F. D. Bowlus. Pp. 977-982.
86. Maintenance of Sanitary Sewers in San Diego, Calif. By B. D. Phelps. Pp. 982-987.
87. Training Operators of Sewage Treatment Plants. By C. MacCallum. Pp. 987-991.
88. Willard State Hospital Treatment Plant. By R. A. Murphy. Pp. 994-998.

E *Engineering News-Record*
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28. c. Forming and Concreting Sewage Tanks. Pp. 51-53.
29. c. Reamping a 50-Year-Old Sewer System. By W. D. P. Warren. Pp. 65-66.
30. Sewage Gas Hazards. Pp. 78-79.

G *Water Works & Sewerage*
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30. The Biofiltration System. By A. J. Fischer. Pp. 481-488.
31. New Sewer Maintenance Truck. By E. P. Decher. Pp. 489-491.
32. Effluent Filters in Sewage and Waste Treatment. By P. B. Streander. Pp. 493-495.

H *Sewage Works Engineering*
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42. New Haven's New Treatment Plants. By C. A. Emerson. Pp. 483-491.
43. Fort Dodge, Ia., Sells $10,000 Power from Sewage and Packing Waste Gas. By T. R. Lovell. Pp. 492-493.
44. Buffalo Treatment Costs $7.98 per M.G. By P. Hansen. Pp. 493-496.
45. Casein Wastes Treated on Trickling Filter at Richland Center, Wis. By W. G. Kirchoffer. Pp. 496-497.
46. Alum Aids Sludge Drying on Sand Beds at Aurora, Ill. Pp. 497-498.
47. Stage Digestion Aids Grand Rapids. Pp. 498-499.
48. Davenport Operates Gas Engines. By R. W. Cook. Pp. 499-500.
49. Flocculator Improves Clarifier at Ypsilanti. By W. R. Drury. Pp. 502-503.
50. Sludge Card-Indexed at Bedford, O. Pp. 503-504.
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52. Elutriation of Sludge at Washington, D. C. Pp. 506-508.
53. Sludge Incineration at Minneapolis-St. Paul. Pp. 508-509.
54. Incinerator of New Rochelle, N. Y. By H. W. Taylor. Pp. 510-511.

J *American City*
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23. New Sewage Treatment Plants for Springfield, Mass. By A. A. Burger. Pp. 43-46.
24. Small Activated Sludge Plant. (London, O.) By L. McNeal. Pp. 63-64.

L *Civil Engineering*
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8. First Year's Operation of Richmond-Sunset (Calif.) Sewage Treatment Plant. By B. Benas. Pp. 641-644.

M *Canadian Engineer*
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7. Barrie, Ont., Sewerage Works. By G. G. Reid. Pp. 7-11, 45.

P *Public Works*
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52. Treatment Plant of a Sanitarium. P. 13.
53. A Month's Operating Results at Liberty, N. Y. Biofiltration Plant. Pp. 16-18.
54. Precautions in Handling Sludge Gas. P. 18.
55. p. Experiences With Paints at a Sewage Treatment Plant. Pp. 32-33.

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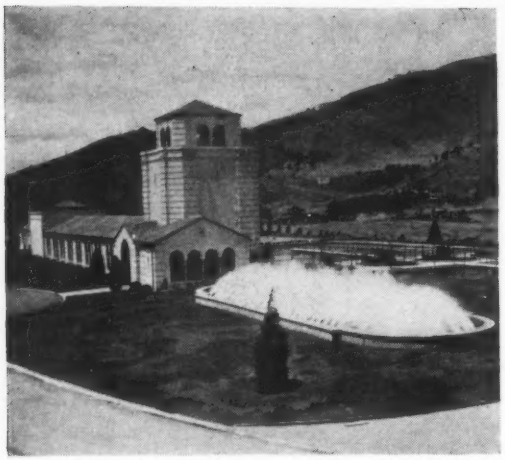


Upper San Leandro filter plant, Oakland, Calif.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

HOW TO FIND ORIGINAL ARTICLES. Key letter at end of each digest refers to name of publication listed in bibliography at end of this section. Numeral indicates title of article.

Combined Municipal Utilities

Lansing, Mich., has been in the water business for 55 years, in the electric business for 48 years and in the steam heating business for 21 years. All these are operated by a single board of eight citizens (two appointed each year) as a combined utility. This permits employing high-grade engineers and workmen. The principal department heads are chief of plants, superintendent of electrical distribution, superintendent of water and steam distribution, mechanical engineer, electrical engineer, purchasing agent, storekeeper, office manager and merchandise manager. To operate successfully several utilities so combined, they must be free from political control, have continuity of managment, operate and grow on their own income and not be required to finance other city departments, and must pay wages that will attract and hold a high type of employee.

The village of Hinsdale, Ill., owns and operates its own electricity plant, water softening and pumping plant and artificial ice plant, all under one superintendent who reports directly to the trustees.[A 141]

Special Rates For Use of Water

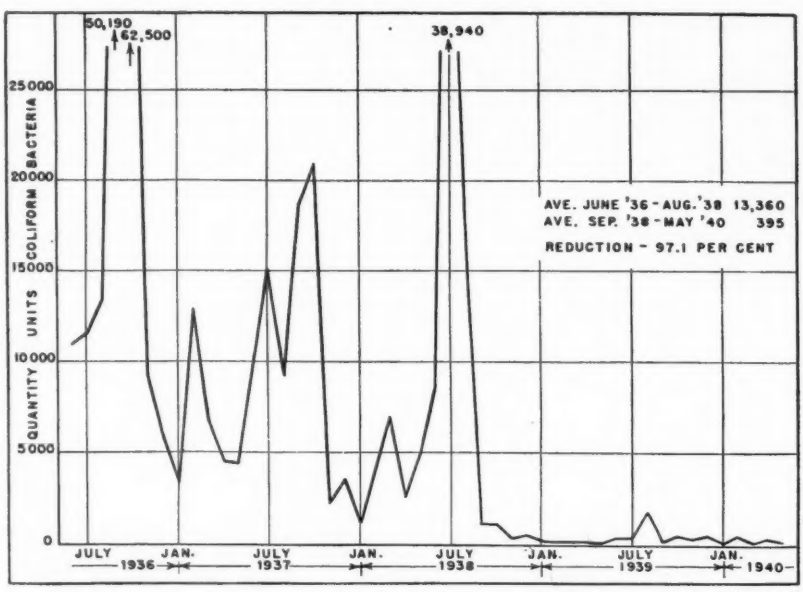
Before granting special rates for water to any class of consumers or any individual ones, the following points should be considered: Present large excess plant capacities or reserve supplies may be needed tomorrow. Special rates once made are hard to rescind. Revenue from water users should support the water department; public uses of water should be paid for by the taxpayers. There is no such thing as free water in the sense that a plant once established can increase its output at only nominal expense. All free water should be metered. Expediency does not justify discrimination.[A 143]

Bacterial Pollution of the Niagara River

Buffalo's sewage has been treated since July 1, 1938, and since then monthly surveys of the Niagara river have been made to determine what improvement this has made in the bacterial pollution of it. The results up to June 1, 1940, are as follows: The coliform content of the river below Buffalo has been reduced approximately 97 per cent, due to interception of sewage to remove it from Buffalo river and harbor, Black Rock canal and Niagara river; treatment of the sewage and disinfection by use of approximately 5,600 pounds of chlorine a day, which kills approximately 98.5 per cent of the coliform and 97.5 per cent of the total bacteria; and partial removal of industrial wastes from the Buffalo river. These improvements have decreased the total bacterial content of the Niagara river by approximately 84 per cent, and the stretch between Buffalo and Tonawanda is now a Class A water and meets the standard for average cross-sectional content set by the International Boundary Commission. The discharge of the sewage plant effluent 200 ft. offshore does not extend the pollution boundary any further into the river; strong winds and flood flows from Buffalo river may push the pollution line beyond its normal boundary, but water plants below Buffalo no longer experience peak bacterial loads. The coliform bacterial condition of the raw water at the Niagara Falls filtration plant has improved by approximately 90 per cent. The removal of approximately 50 tons daily of dry solids from the river gives a clearer stream more conducive to recreational uses.[A 153]

Corrosion Control by Hexametaphosphate

Fairhaven, Mass., obtains its supply from driven wells. The water averaged 30 ppm. of carbon dioxide and a pH value of 5.4, and there was much corrosive action. It was found that the usual use of lime or soda ash would reduce corrosion but slightly and would increase deposition of iron hydroxide in the system, and the use of sodium hexametaphosphate



Courtesy American Water Works Ass'n.

Total Coliform Bacteria in Niagara River

was tried. One ppm. was applied to the suction main. The first effect was purgative, accumulated iron oxide sloughing off the mains, but by careful operation, conditions were controlled until this effect ceased to be important. Before adding metaphosphate, tests showed 0.40 ppm of iron in the well water, 0.08 ppm. in the centre of the town and 0.95 ppm. in a long dead end. After six weeks of treatment the figures increased to 0.60, 0.27 and 16.0 ppm., respectively. In six months the iron had decreased to 0.11, 0.07 and 0.10 ppm. The color has been reduced from 29 to 5.[A 146]

Effect of Pipe Lining on Water

Tests with the water supplied to Atlanta Ga., on the effect of various pipe materials on that water have been conducted since May 1937. Analyses were made of turbidity, color, hardness, temperature, CO_2, pH, iron, phenolphthalein and total alkalinity, dissolved oxygen, residual chlorine and total solids, and observations of the stain caused by continuous dripping onto a porcelain plate. Tests were made on cast iron, concrete, cement, asbestos, copper, aluminum alloy, and brass service pipe without lining; and on cast iron and steel pipe lined with bitumastic, Barrett enamel, "duroline," Hill-Hubbell pitch, "enameline" and other thin cement lining, and galvanizing. It was concluded that, in contact with Atlanta water, bare or unlined ferrous pipe shows internal corrosion sufficient to cause tuberculation and staining where rate of flow is low. All the linings reduced internal corrosion, although the ordinary tar dip gave little protection. Most cementitious pipe shows markedly less staining, but the hardness, alkalinity and pH are increased unless the cement is protected by a seal coat. (Recently developed low-soluble cement is rapidly gaining favor.) Bituminous enamel or pitch linings do not cause increase in hardness and alkalinity and, when carefully made, reduce the tendency of the water to stain. Galvanizing, particularly of service pipe, is of considerable value in preventing corrosion, at least for the duration of these tests. Copper, brass and aluminum alloys show little or no attack. The iron content varied from 0.02 ppm. (that of the applied water) to 0.08 ppm. with lined pipe; 0.35 ppm. with tar dip, and 0.74 ppm. with unlined cast iron.[A 154]

Split Lime Treatment In Corrosion Control

Biddeford, Me., uses alum coagulation. As the raw water has alkalinity dropping as low as 5.0 and averaging 7.7, the reaction of the alum is incomplete, especially in cold weather. Soda ash was used to counteract the low pH. Being a summer resort, consumption is low in winter, and the corrosive activity increased. Increasing the soda ash dose helped to reduce corrosion but was expensive and not entirely satisfactory and caused a medicinal taste. Lime was tried, added to the filtered water, and found much more effective than soda ash but much more difficult to control, but the dosing was finally adjusted to give a very uniform water. But the lime completed the partial reaction of the alum and caused secondary floc formation. This was eliminated by splitting the lime dose. Adding part of the lime ahead of the alum set the color, and best results were obtained by adding it near the outlet end of the baffle chambers, where the mixing and agitation of water and alum is nearly completed. The optimum dose varied with temperature, turbidity, color and other characteristics.[B 29]

Mixing and Flocculation at Raleigh

At the Raleigh, N. C., filter plant, which was completed last May, there are three mixing units—flash air mixing, medium-speed mechanical vertical paddle mixing, and slow flocculation with horizontal paddles. Any one or any combination of these can be used. Air mix is found beneficial at certain seasons of the year; the equipment consists of two centrifugal type compressors connected to a header to which porous tubes are attached. The medium speed mixer consists of a vertical shaft with four horizontal arms at right angles from which are suspended metal paddles. The flocculator is a Dorr type. The eight filters, built in a single row, have Wheeler bottoms. On each filter operating table are a com-

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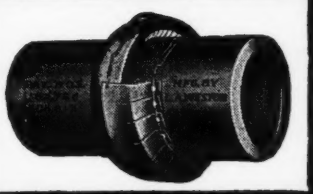

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Temperature and Water Resources

Records indicate that average temperature has been going up appreciably over the past few decades, and with it evaporation, and is still going up at a relatively rapid rate. It therefore appears that we are confronted with no short weather cycle. The effect is likely to continue for many years even if the cycle should soon begin to reverse its trend. Furthermore, it appears that the time has been reached when trends in rainfall and temperature as well as annual averages of runoff must be taken into consideration in studies of water supplies in the mid-continent area.[L 12]

Water for Soft Drinks

Water used by the soft drink industry should at all times meet the Treasury Department bacteriological standard, be clear and sparkling, without visible color, no detectable odor either hot or cold, contain no visible suspended matter or microscopic silt or organic bodies, have hardness under 200 ppm. and alkalinity under 50 ppm. (the lower the better), and an iron content of less than 0.1 ppm. It is also desirable that the various characteristics remain constant; variation in alkalinity changes the taste of the beverage by varying neutralization of the acid content. The gross sales of the industry total over two billion dollars a year.[A 151]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

A *Journal, American Water Works Ass'n.*
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141. Management of Combined Municipal Utilities. By O. E. Eckert. Pp. 1435-1445.
142. A Customer Service Bureau. By H. F. Smith. Pp. 1446-1453.
143. Special Rates and Free Water Service. By D. L. Maffitt. Pp. 1454-1458.
144. Experiences With a Department Newspaper. By G. S. Bonn. Pp. 1459-1469.
145. t. The Physiology of Sodium Hexametaphosphate. By K. K. Jones. Pp. 1471-1483.
146. Corosion Control by Sodium Hexametaphosphate. By H. T. Gidley and R. S. Weston. Pp. 1484-1494.
147. Notes on Corrosion Prevention by Sodium Hexametaphosphate. By E. C. Trax. Pp. 1495-1497.
148. Progress Report on the Use of Sodium Hexametaphosphate at Garden City, N. Y. By A. H. Rogers. Pp. 1498-1500.
149. t. Bacterial Depreciation of Water Quality in Distribution Systems. By N. J. Howard. Pp. 1501-1506.
150. Water Treatment and Laboratory Control. Committee report. Pp. 1507-1511.
151. The Water Quality Requirements of the Soft Drink Industry. By K. Mott. Pp. 1512-1516.
152. Calcium Hypochlorite in Water Purification. By J. O. Logan and W. L. Savell. Pp. 1517-1527.
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155. Development of Ann Arbor Water Supply. By H. H. Caswell. Pp. 1577-1586.
156. Water Softening at Ann Arbor. By L. E. Ayres. Pp. 1587-1599.
157. Operation of the Ann Arbor Softening Plant. By H. E. McEntee. Pp. 1600-1618.

October

158. The Use and Abuse of Depreciation. By J. H. Murdoch, Jr. Pp. 1647-1665.
159. Property Records and Valuation. By R. Newsom. Pp. 1666-1676.
160. Efficiency in Managing Water Works Properties. By L. N. Thompson. Pp. 1677-1688.
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162. Pipe Laying Up To Date. By P. Burgess. Pp. 1696-1704.
163. Service Life of Coal Tar Enamel Protective Coatings. By H. Hayes. Pp. 1705-1722.
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166. Present Status of Cross Connection Control. By E. S. Chase. Pp. 1737-1752.
167. Water Quality Standards. By J. R. Baylis. Pp. 1753-1769.
168. Investigation of a Water Pressure Tank Explosion. By R. J. Karpen. Pp. 1770-1774.
169. Water Supply at Akron, O. By Department Staff. Pp. 1775-1799.

B *Journal, New England Water Works Ass'n.*
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27. Studies of Frost Penetration. By H. U. Fuller. Pp. 275-281.
28. The Story of PWA in Maine Water Works. By F. J. Reny. Pp. 282-287.

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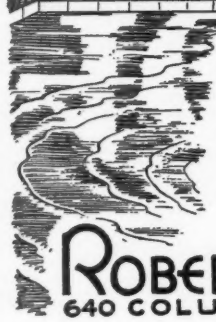

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29. Experiences With Corrosion Control at Biddeford, Me. By E. T. McDowell. Pp. 288-293.
30. Modern Engineering Practice and Two-Inch Cast-Iron Pressure Pipe. By C. D. Cox. Pp. 294-298.

D *The Surveyor*
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24. p. Control by Automatic Valves. By A. A. Fulton. Pp. 107-109.
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25. Rand Water Board Activities. Pp. 135-136.
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27. p. Barston Sewage Works of the Birmingham, Tame and Rea Drainage Board. By C. H. Hewitt. Pp. 163-165.

E *Engineering News-Record*
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40. Building Baltimore's Big Tunnel. By J. J. Hunt and B. L. Werner. Pp. 56-60.

F *Water Works Engineering*
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91. Water Dept. Practices at Concord, N. H. By N. N. Wolpert. Pp. 1284-1287.
92. p. Filter Operation and Maintenance. By J. R. Baylis. Pp. 1288-1290.
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93. p. Water Supply in Time of War. By F. F. Longley. Pp. 1344-1348, 1367.
94. p. Filter Operation and Maintenance. By J. R. Baylis. Pp. 1351-1353, 1368.
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G *Water Works & Sewerage*
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42. New Filter Plant and Pumping Station at Raleigh, N. C. By W. C. Olsen. Pp. 449-460.
43. Rehabilitation of Force Mains at Akron, O. By W. R. LaDue. Pp. 469-474.

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8. p. Water Requirements of Industry. By D. W. Robinson. Pp. 24-27, 41.
9. Tulsa, Okla., Water Supply. By W. F. McMurray. Pp. 29-30.

W *Johnson National Drillers Journal*
September-October
5. The Permeability of Water-Bearing Rocks. Pp. 1-7, 10.

Public's Equal Right to Potable Water

The impounding and distribution of potable waters are rights held in trust by the State for the benefit of all its inhabitants. A State may not grant or divest itself by contract of control of rights and properties held for the benefit of all the people, for in doing so it would divest itself of an incident of sovereignty and of powers vital to the public welfare. The New York Appellate Division holds, (City of Syracuse v. Gibbs, 17 N. Y. S. 2d. 293) that while the legislative grants to the city to acquire, construct, maintain and operate a waterworks system were unlimited and the city acting thereunder had spent millions of dollars, the city's title was subject to the sovereign power to control the just and equitable distribution of potable waters. A decision in 1931 of the Water Power and Control Commission that the inhabitants of certain towns had rights superior to those of the City of Syracuse in the waters of Skaneateles Lake was not adopted by the court, which added: "The entire public has an equal right to potable water. The Commission is to exercise just and fair supervision, to the end that supplies which are more available for use by one community are not absorbed by another."

Recovery for Engineer's Plans

In an action against a municipality to recover on a *quantum meruit* for services rendered by the plantiff in preparing plans for a municipal water works system, the Second Circuit Court of Appeals (Potts v. Village of Haverstraw, 110 F. 2d 58) affirmed judgment for the plaintiff in the Federal District Court of Southern New York, although the services were rendered under a contract which was adjudged illegal because it was executed before the passage of the resolution of the village's trustees authorizing the construction of such a system and the ratification thereof by referendum, at least for the services rendered under such ratification.

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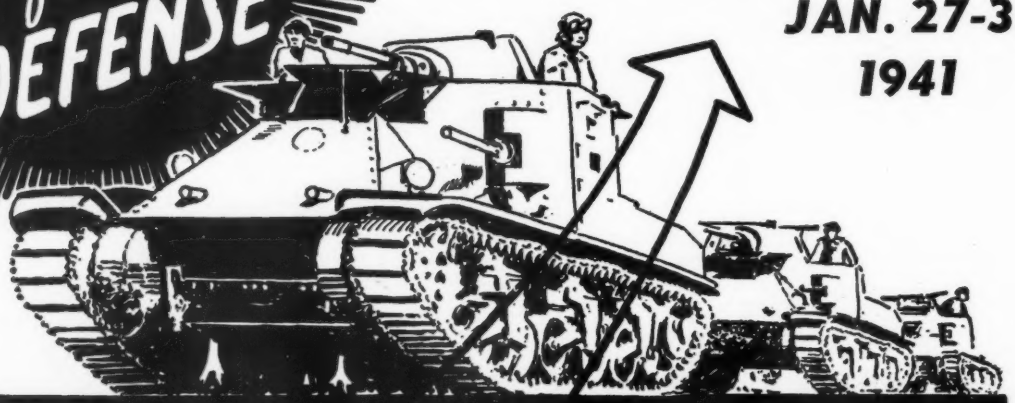

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- Every governing body should give its engineers a chance to keep up to date—send them to the Good Roads Convention.

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When you need special information—consult the *classified* READER'S SERVICE DEPT., pages 63-65

Keeping Up With New Equipment

A New Lightweight 60-Cu. Ft. Compressor

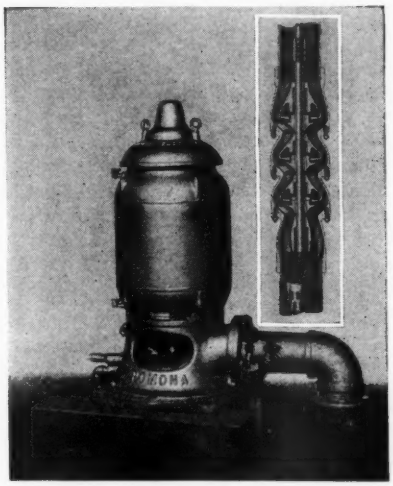
Ingersoll-Rand Company has just introduced a new two-stage air-cooled compressor that delivers 60 cu. ft. of free air per minute at a discharge pressure of 100 lbs., the D-60. The unit is extremely compact and light in weight. It will operate most of the rock drills, grinders, paint sprays and other pneumatic tools that are in common use today. It is handy for many small contracts and for a great variety of odd jobs. It enables municipal service departments to speed up their work by putting air tools on their jobs. On many big contracts, it will take care of the urgent here-and-there jobs, and free larger compressors for other work. It is easily portable. Three types of mountings are available, all built around the same gasoline engine-compressor plant. A handy mounting, the "Push-about," is on roller-bearing, pneumatic-tired

The new Ingersoll-Rand 60 cu. ft. Push-about Compressor.

wheels. It is well balanced and can be easily rolled on and off a truck. One man can handle it on the ground. A turtle-back cover protects the compressor and engine from the weather and provides a means of locking the wheels against theft.

Redesigned 6-inch Vertical Turbine Pump

The Pomona Pump Company, Pomona, California, announces the complete redesign of its line of 6" medium capacity vertical turbine pumps. The manufacturer states that the new models give higher efficiency and better performance. For a desired capacity of 100 G.P.M. against 110-ft. lift in a well and 50 lbs. pressure above, a 7½ H.P. motor is required, as against a 10 H.P.



Pomona 6" vertical turbine pump.

motor with the old model. The efficiency of this particular size pump for this head capacity has been increased 6½ points, the number of stages has been reduced one-fourth and finally, the initial cost of the entire unit has been lowered 20 per cent.

Other advantages claimed for these pumps are that they are water-lubricated, with no stuffing box below ground level; that the specially-designed semi-open impeller can be adjusted from the surface for wear and for changing capacity; and that they are non-sandlocking and non-gaslocking.

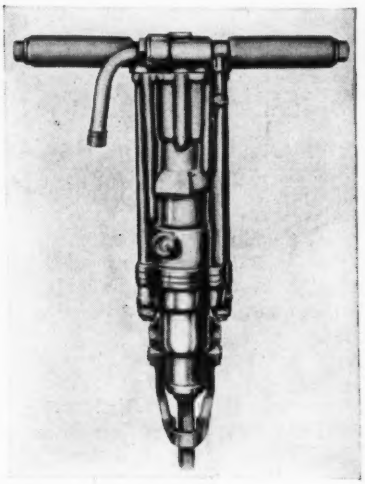
An Air Cooled Engine

Due to the successful record of the air cooled engine, whose use the Jaeger Machine Company pioneered on thousands of contractors pumps, this type of power has enjoyed growing popularity on concrete mixers also. This latest model Jaeger 10S SPEEDLINE Mixer is an example. It is equipped with Model VE-4 Wisconsin Air Cooled Power Unit, which is not only lighter, simpler and more compact but eliminates the usual hazards of cold weather operation. No radiator, water pump or cylinder block to freeze, or give other trouble, no anti-freeze to buy or replenish, no greasing since power unit is automatically lubricated.

Other outstanding features include Jaeger's exclusive Automotive-Type Transmission (fully enclosed, running in oil bath, quiet, efficient, trouble-free) Machined Steel Drum Tracks, Criss-Cross Remixing Drum, Jaeger Automatic Skip Shaker, "Pressure" Discharge, Jaeger Accurate Water Regulator and end discharge trailer design with 2 or 4-wheel mounting interchangeable.

A Rock Drill With Cushion Control

The latest Sullivan drill, Class L-57, is equipped with dual valve and cushion control, two new and valuable contributions to drilling efficiency. By means of this dual valve, air is controlled independently at each end of the piston; that is, the correct volume of air to give maximum striking power is admitted behind the piston, the valve is closed and the piston is propelled by expansion of the air. After the blow is delivered, air is admitted ahead of the piston to give a return stroke with strong rotating power. Premature admission of live air ahead of the piston (which reduces force of blow) is avoided.



Sullivan rock drill with cushion control.

This cushion control is claimed to give increased air efficiency, high drilling speed, low air consumption and ease of handling. This 57-lb., 24-inch machine drills easily to a depth of 14 to 16 ft. It is equipped with shake-proof, five position throttle handle, rubber cushioned steel puller and 4-hour capacity oil reservoir. It provides full line-pressure hole blowing and is available in dry, blower or wet types (easily interchangeable) and with various chuck sizes and rotation speeds.

The L-57 can be supplied with cradle and shell mountings, with rigid or sliding trunnion for 24" or 30" steel changes, or can be mounted on Featherweight automatic or motor feed wagon mountings for 4 ft. or 6 ft. steel changes. Ask for Bulletin 87-H, Sullivan Machinery Company, Woodland Avenue, Michigan City, Indiana, or Claremont, N. H.

Buckeye trencher

Trencher Expedites Airport Drainage Work

A Model 160 Buckeye boom type trencher owned by W. C. Wells Construction Co., Saskatoon, Saskatchewan, Canada, has expedited digging of drainage trenches at the Saskatoon airport, enabling drainage lines to be placed with speed.

The trencher cut outfall and lateral trenches for the drainage system. Its ability to dig up to 12′ 6″ deep and from 16″ to 42″ wide made possible properly graded trench for carry-off of storm water from all points of the field.

The trencher is shown at work, with spoil being discharged to the right; but spoil can be discharged to either side and the digging bucket boom is also shiftable to either left or right.

Conveyor Weightometer for Sewage Treatment Plants

The Weightometer is ingeniously designed to perform the function of continuously weighing moving loads by mechanically multiplying together two variable quantities and totalizing the successive products.

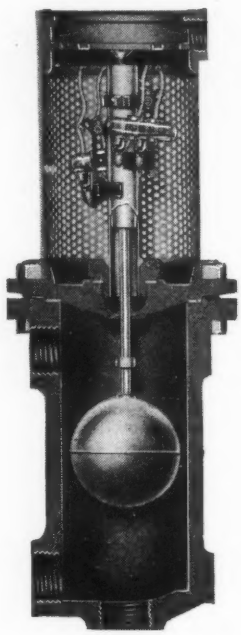
With the Weightometer the manufacturers say filter cake can be weighed most conveniently by a weightometer on the belt conveyor right after the filters. Continuous weighing and integrating this way gives total weight by direct reading.

A Rateograph with 12 in. chart mounted on an instrument panel in the filter press room, or at any other remote point, will show graphically the rate of cake discharge.

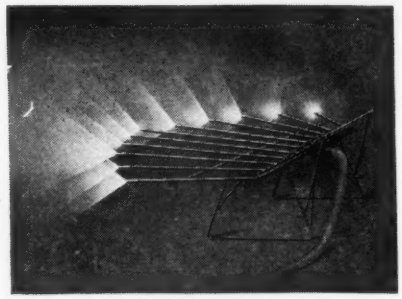
Weightometers have been installed in a number of sewage disposal plants, among them the Detroit and Chicago Southwest sewage treatment plants. Full information will be sent upon application to the manufacturers, Merrick Scale Mfg. Co., Passiac, N. J.

A Magnetrol Liquid Level Control

Schaub Magnetrol employs a simple principle of operation to gain a desired switching action in float type liquid level controls. This action is obtained through the rise and fall of a piston attached to a float rod moving up and down in an inclosing tube. As the piston reaches a predetermined level in the tube, it comes into a magnetic field produced by a permanent magnet located on the outside of the inclosing tube. When this occurs, the magnet is drawn toward the piston, thereby causing a tilt action of a mercury-to-mercury switch, which is a part of the magnet relay arm. By this positive, simple means of obtaining switching action, the Magnetrol eliminates all bellows, stuffing boxes, packing, and rotary shafts, which have binding, sticking, breaking, and rupturing possibilities. The Magnetrol is also unaffected by temperatures or operating pressures. As standard equipment it comes in two separate models. One model has a single switching action which may be used as a low water cutoff on a steam boiler or to operate a pump or an energized valve in connection with a tank or other liquid level application. The other model incorporates three stages of liquid level control for use as a low water cutoff, pump control, and high water cutoff on boilers or for stage control on other liquid level applications. For complete information write Fred H. Schaub Engineering Co., 325 W. Huron St., Chicago, Ill.



Schaub Magnetrol



Skating pond spray

Nylon for Sewage Screen Brushes

A product of E. I. duPont de Nemours & Co., these brushes, which sweep across a highly abrasive drumlike filter screen, operate continuously in water and are subject to the action of distillate oil which cuts grease on the brushing surface.

Nylon bristling material was first tried in Milwaukee's fine screening plant. A set of eight nylon-bristled brushes was installed there in March, 1939. Eighteen months later they were still functioning as well as ever.

Engineers of the Milwaukee Sewage Commission computed the wearing rate of nylon brushes at 1/16 of an inch a year. They found that hog bristles wore down four times as fast.

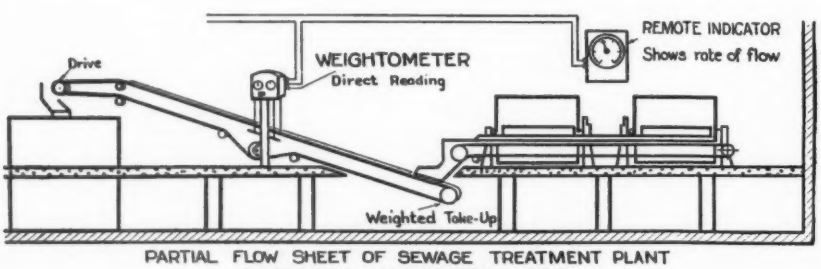
Provides Inexpensive, Safe Skating Rinks

Smooth, safe skating rinks may now be quickly and inexpensively formed with a new skating pond spray manufactured by Russell Mfg. Co., Platteville, Wisconsin.

In addition to protecting lives of children who enjoy skating, it is said the device will pay for itself in a single season—by the speed with which it forms a pond, by eliminating need for earth or lumber embankments and through cutting water requirements 90 per cent. It provides a glass-like surface and resurfaces roughened ice in a couple of hours.

Any vacant lot is suitable as a site. Operator simply sets machine in position, connects hose to a convenient hydrant and turns on the water. A series of nozzles shoots out a thin spray which freezes as it hits the ground. Machine is moved back and forth over area until about one inch of ice is built up. A 350 ft. pond may be made in less than 10 hours.

Copies of a new bulletin describing this Masbruch Manifold Skating Pond Spray may be had by writing to Russell Mfg. Co., Dept. J, Platteville, Wis.



PARTIAL FLOW SHEET OF SEWAGE TREATMENT PLANT
MERRICK WEIGHTOMETER
CONTINUOUSLY WEIGHING FILTER CAKE

A. D. MacLean Elected Vice President of Pittsburgh Equitable Meter

Colonel W. F. Rockwell, President of the Pittsburgh Equitable Meter Company, has announced the election of Mr. A. D. MacLean to the Vice Presidency of the Company.

Mr. MacLean is a graduate of the

A. D. McLean

School of Engineering, Harvard University. Immediately upon receiving his degree, he enlisted in the Army Air Service Corps, serving therein until the Armistice in the World War. His first connection in industry was with the Ashton Valve Company of Cambridge, Mass., as Chief Draftsman. He later accepted a position with the Engineering Department of the New Departure Division of General Motors Corporation and was subsequently promoted to become Assistant Chief Engineer.

In 1926 Mr. MacLean joined the EMCO organization as Chief Engineer, which position he has filled until the present date.

Mr. MacLean is well known in industry as an author and lecturer on technical subjects.

Sterling Pump Acquires Roots-Connersville Blower Turbine Pump Division!

Sterling Pump Corporation, Hamilton, Ohio, manufacturers of deep well turbine pumps and vertical centrifugal pumps for sewage and industrial purposes, has acquired the Turbine Pump Division of the Roots - Connersville Blower Corp. of Connersville, Indiana.

Roots - Connersville horizontal turbine pumps are generally used for water systems, and, according to Henry J.McKenzie, President of the Sterling Pump Corp., "the acquisition of this line places Sterling in a strong position for the furnishing of any type of pumping equipment."

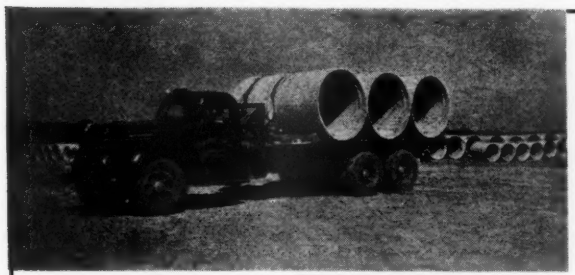
A transfer of inventory has already been made from Connersville, Indiana, to Hamilton, Ohio, according to Mr. McKenzie, and all former Roots-Connersville installations will now be serviced, if and when necessary, by an enlarged staff of Sterling engineers available from coast to coast.

Mr. McKenzie, formerly executive Vice-President and General Manager, has been appointed President to succeed Maurice Rothschild, who will continue as a director.

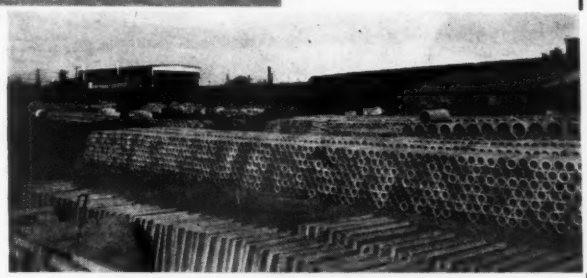
Mr. McKenzie, who also retains his duties of General Manager in addition to those of President, has long been identified with and is an outstanding and well-known personality in the pump industry.

A Compressor with Fluid Drive

First application of the fluid drive principle in the manufacture of portable air compressors has been announced by the Davey Compressor Company, Kent, Ohio. This drive, which makes possible entirely automatic compressor operation, is a feature of the new "Davey Air Aristocrat," a machine in the 105-cubic foot size. New features in addition to the fluid drive are streamlining of the entire unit, full semi-elliptical spring mountings, and centralization of all gauges and controls on one instrument panel. Thermostatic heat control and a built-in tool box are included as standard equipment. Air leaks are eliminated by the utilization of welded joints for every connection.



New National Airport at Gravelly Point, Washington, D. C. Over 60,000 ft. of 12"—60" Lock Joint Concrete Pipe used for drainage and sewerage.



Lowry Field, Denver, Colo. Part of more than 78,000 ft. of 6"—42" Lock Joint Concrete Pipe used at this airport. 18,000 ft. used for sewerage of buildings, quarters and barracks.

LOCK JOINT PIPE
FOR DEFENSE CONSTRUCTION

In Defense Construction speed is essential—but quality must not be sacrificed.

Ten permanent plants, strategically located throughout the country, carry large stocks of Lock Joint sewer, culvert, and drain pipe available for immediate use. On large projects, the pipe can be manufactured right at the site, using local labor and materials.

The recognized quality of Lock Joint Concrete Pipe is maintained through careful control of every process in its production, by men especially skilled in the fabrication of plain and reinforced concrete pipe.

Several of the many uses for Lock Joint Concrete Pipe in National Defense work include: sewers, culverts, drains and water supply lines for Airports, Army and Navy Bases, Municipalities, Power Projects, Factories, Railroads and Highways. Lock Joint Concrete Pipe can be supplied in sizes from 6" to 150" in diameter—and for pressures from zero to 600 ft. of head.

You'll find a representative at any one of our permanent plants prepared to help you in every way.

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Hartford, Conn.

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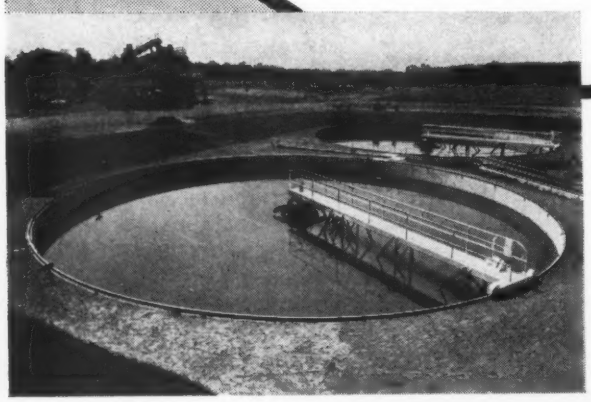
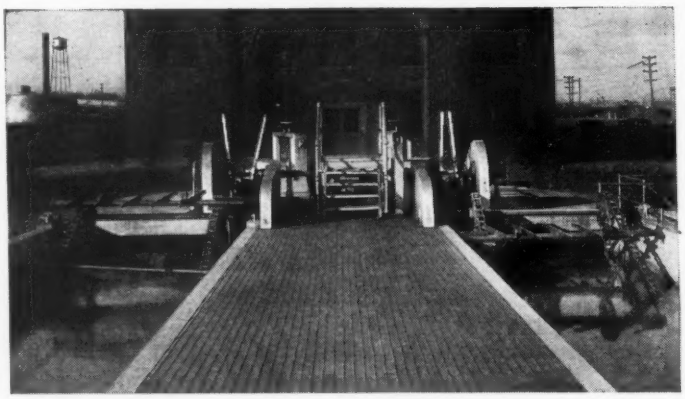
TRITOR SCREENS
•
GRIT CHAMBER EQUIPMENT
•
MIXING EQUIPMENT
•
STRAIGHTLINE COLLECTORS
(For Rectangular Tanks)
•
CIRCULINE COLLECTORS
(For Center-Feed Round Tanks)
•
SCUM BREAKERS FOR DIGESTION TANKS
(Round or Rectangular)

LINK-BELT COMPANY
Philadelphia Chicago Cleveland Indianapolis
Los Angeles Toronto
Offices in principal cities



Above: Link-Belt CIRCULINE Collector. It has all the advantages of the STRAIGHTLINE type collector with the added advantage of low cost concrete construction for large tanks.



Above: The Link-Belt STRAIGHTLINE Mechanically Cleaned Bar Screen has spaced parallel bars on which the larger floating solids in incoming sewage collect, and a mechanically operated rake for removal of the accumulating solids, thus assuring an even flow of sewage through the channel. The machine may be set vertically or inclined, and used in small or large plants.

8100-C

Link-Belt STRAIGHTLINE Grit Collector and Washer. This unit collects settled grit and frees it from putrescible organic matter. It consists of a scraper type collector with pitched flights and an inclined washing and dewatering screw to which the collector conveys the grit. Send for special literature.

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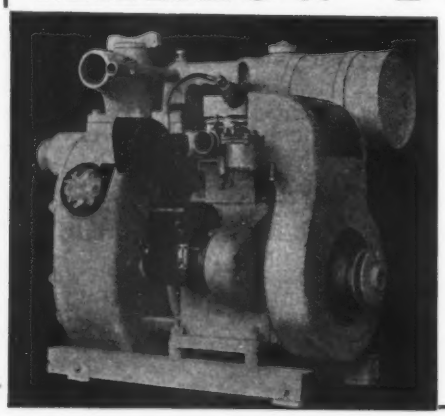

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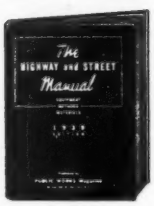

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310 EAST 45th STREET, NEW YORK, N. Y.

PERSONAL NEWS

The following new appointment as city manager has been reported:
W. H. Carper, Culpeper, Va.

The following new appointments as city engineers have been reported:
G. M. Heinsen, Glenwood Springs, Colo.
C. L. Harrington, Idaho Springs, Colo.
C. M. Slusser, Julesburg, Colo.
Sydney A. Rapp, Danbury, Conn.
M. J. Jankowski, Acting, Stratford, Conn.
Chas. A. Nagel, Downers Grove, Ill.
Chas C. Coe, Fort Scott, Kan.
H. V. Erickson, Hays, Kan.
Arthur J. Jennings, Monroe, Mich.
Lester A. Hedenstrom, Laurel, Mont.
Hugh McKee, Cohoes, N. Y.
J. C. Harding, Mt. Kisco, N. Y.
Robert M. Schaefer, Sidney, N. Y.
Louis J. Rossi, Westerly, R. I.

The following new appointments as county engineers have been reported:
C. C. Driver, Macon County, Tuskegee, Ala.
S. B. Stuck, Davis County, Bloomfield, Ia.
W. W. Stevens, Ouachita Parish, Monroe, La.
Glen C. Bickley, Chisago County, Center City, Minn.
Albert Hurley, LaMoure County, LaMoure, N. D.
Percy Harper, LeFlore County, Poteau, Okla.

The following new appointments as water works superintendents have been reported:
Albert H. Todd, Talladega, Ala.
Mr. McNeely, College Park, Ga.
Wm. F. Conrad, Bicknell, Ind.
Leo V. McDonald, Princeton, Ind.
Walter Downey, Indianola, Ia.
J. A. Hunt, Fort Scott, Kan.
F. E. Dunham, Corinth, Miss.
N. S. Skinner, Brookfield, Mo.
William Marra, Cohoes, N. Y.
Herbert F. Lord, Fostoria, Ohio.
I. Vagnozzi, Youngstown, Ohio.
T. G. Fowler, Ada, Okla.
A. J. Scheer, Drumright, Okla.
Dan Shepard, Henryetta, Okla.
R. T. Price, Muskogee, Okla.
J. I. Chambers, The Dalles, Ore.
W. C. Peterson, Renova, Pa.
R. R. Huff, Summersville, W. Va.

C. A. Emerson, Alfred A. Burger, Frank C. Tolles, and Frank W. Jones will specialize in the field of water supply, sewerage and wastes disposal, and will continue the business formerly conducted under the name of Gascoigne & Associates. The present partnership includes all of the former associates of the late George B. Gascoigne, with organization, personnel, and address unchanged.

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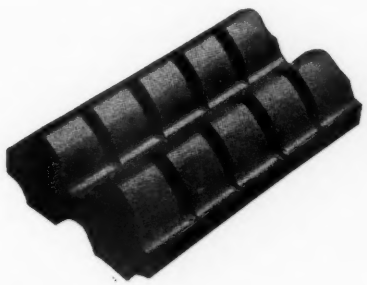

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Societies

Annual Meeting of Highway Research Board

The Twentieth Annual Meeting of the Highway Research Board of the National Research Council will be held in Washington at the building of the National Academy of Sciences the week beginning December 2.

Sessions of the Board will be held on Wednesday, Thursday and Friday, December 4 to 6. In addition, several Departments of the Board will hold open meetings on Tuesday, December 3.

According to the tentative schedule released by Roy W. Crum, Director of the Board, the Departments of Design, Materials and Construction, Maintenance, Economics and Soils and the Committee on Roadside Development have scheduled meetings on Tuesday, December 3.

American Public Health Ass'n Officers

At the 69th Annual Meeting of the American Public Health Association in October the following officers were elected: President, W. S. Leathers, M.D., Nashville, Tenn.; President-elect, John L. Rice, M.D., New York, N. Y.; Vice President, Robert D. Defries, M.D., Toronto, Can.; Vice President, Charles Edward Finlay, M.D., Havana, Cuba; Vice President, Selskar Gunn, New York, N. Y.; Treasurer, Louis I. Dublin, Ph.D., New York, N. Y.; Chairman of Executive Board, Abel Wolman, Dr. Eng., Baltimore, Md.; Executive Secretary, Reginald M. Atwater, M.D., New York, N. Y.

The 70th Annual Meeting will be held in Atlantic City, N. J., in October, 1941.

National Asphalt Conference and Meeting of Asphalt Paving Technologists

The Thirteenth National Asphalt Conference and Annual Meeting of the Association of Asphalt Paving Technologists will be held at the Adolphus Hotel, Dallas, Texas, Dec. 9-13. The general theme will be "National Defense," discussing the practical application of asphalt to the highway and airport defense program of the nation.

Cooperating with the Asphalt Institute will be the U. S. Public Roads Administration, the Highway Research Board of the National Research Council, the Association of Asphalt Paving Technologists and the State Highway Department of Texas.

A Program Committee, consisting of representatives of these organizations, has prepared a program in which the foremost engineers and technologists of the Public Roads Administration, the National Research Council, the Corps of U. S. Army Engineers, the Civil Aeronautics Board, the State Highway Departments, the Works Project Administration, and City Engineers will discuss and evolve methods for asphalt use particularly designed to meet National Defense needs.

Featured subjects will include: Highways and Airports for National Defense, Reinforcing and Widening Existing Highways, Elimination of Bottle-Necks, Highway Principles Applicable to Airports, Asphalt for Erosion Control and Railroad Ballast and Asphalt Pavement Thickness with Reference to Sub-grade Support.

The Technologists will hold technical sessions on Monday and Wednesday; the Asphalt Conference on Tuesday and Thursday.

Course in Research Laboratory Management

New York University College of Engineering is offering a course in research laboratory management, to begin in February under the direction of Dr. L. P. Alford, chairman of the Department of Administrative Engineering. The course, which will consist of 16 evening lectures, has been planned in cooperation with an advisory committee of industrial research executives headed by Maurice Holland, director, Division of Engineering and Industrial Research, National Research Council. It is estimated that there has been a 100 per cent increase in the number of research laboratories established since 1927 and in the demand for men trained to manage them.

Recent Booklets

Airport Drainage.—A new 32-page booklet has been published by Toncan Culvert Mfrs. Ass'n., Cleveland, O., which covers principles and requirements of an airport subdrainage system, and is illustrated with tables, sketches and actual installation photographs.

Painting Creosoted Wood.—A new leaflet on this subject has been issued by Wood Preserving Corp., Koppers Bldg., Pittsburgh, Pa., covering seasoning after treatment; directions are given for painting with aluminum paint.

Blowers.—Allis-Chalmers Mfg. Co., Milwaukee, Wisc., has issued a new bulletin on single stage turbo-blowers for providing large volumes of air or gas at pressures of 1 to 6.25 pounds. Ask for Bulletin B-6048.

Concrete and Bituminous Mixers.—A new 20-page catalog illustrates and describes a complete line of Kwik-Mix mixers, including the small concrete mixer, plaster and mortar mixers and hot and cold patch bituminous mixers. 65 illustrations. Kwik-Mix Concrete Mixer Co., Port Washington, Wisc.

Hypochlorination.—The new Bulletin WAT of Proportioneers, Inc., 96 Codding St., Providence, R. I., describes construction and operation of hypochlorinators. Also available in Spanish. The lady on the cover has a black eye, which Proportioneers assures us no one needs to worry about.

Bio-Filtration.—This new and successful method of sewage treatment is described in Folder 1881, Link-Belt Co., 307 No. Michigan Ave., Chicago, Ill. Information on extent of treatment and the use of one or two stage treatment.

Chemical Solution Feeders.—Bulletin 302, International Filter Co., 325 West 25th Place, Chicago, Ill., describes the new Infilco MCO chemical solution feeders for aluminum sulfate, sodium aluminate, ferric chloride, sulfate of iron, soda ash, caustic soda solutions, etc.

Mixed Flow Pumps.—Bulletin 6360, Fairbanks, Morse & Co., Chicago, Ill., describes mixed flow vertical propeller pumps for large capacity pumping operations, such as land drainage, flood control, storm water handling, unwatering excavations, municipal pumping, and similar applications. Capacities up to 60,000 gpm.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

OF PUBLIC WORKS, published monthly at New York, N. Y., for October 1, 1940.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. T. Morris, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the PUBLIC WORKS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Public Works Journal Corp., 310 East 45th St., New York, N. Y.; editor, A. Prescott Folwell, 310 East 45th St., New York, N. Y.; managing editor, none; business manager, J. T. Morris, 310 East 45th St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.

Public Works Journal Corp., J. T. Morris, W. A. Hardenbergh, Croxton Morris, A. Prescott Folwell and Anna Morris all of 310 East 45th St., New York, N. Y.; Wesley Hardenbergh, Golf, Ill. Sumner N. Hume, address unknown.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) Bertha Morris, White Plains, N. Y.; Elizabeth Hardenbergh, White Sulphur Springs, N. Y.; Mary Sunderland, Liberty, N. Y.

4. That the two paragraphs next above, giving the names of owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is ..... (This information is required from daily publications only.)

J. T. MORRIS, Business Manager.

Sworn to and subscribed before me this 30th day of September, 1940.

CROXTON MORRIS,
Notary Public, Westchester County, N. Y.
Cert. filed in N. Y. Co. No. 847, Reg. No. 1-M-512.
Commission expires March 30, 1941.
(Seal)